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VOL. XVIII. No. 9. MARCH, 1898. PRICE, 6D. POST FREE, 8D.

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THE COMING PRESIDENT OF THE N.U.T.

MR. RICHARD WADDINGTON,

Vice-President of the National Union of Teachers.

THE interview no less than the magistracy shows the man, and the National Union may be congratulated on its future President, if he comes as successfully through his year of office as he did through the modern Chamber of the Inquisition. Mr. Waddington is, indeed, an ideal 'subject' for the interviewer. Thoroughly believing in the policy he enunciates, there is no shrinking—no hedging in his answers. Emphatic, crisp, clear cut as a new coin, his sentences were given forth with as much enthusiasm and verve to his audience of one, as when, with uplifted finger and threatening mien, he harangues the public on the iniquities and absurdities of the half-time system, which he has done so much to discredit.

I had caught him between two important Committees of the Executive, and knowing how limited was his time, plunged at once *in medias res*.

'For the PRACTICAL TEACHER?' he remarked, as I explained my mission, 'Why certainly. Nothing could give me greater pleasure. It will be quite like reviving old friendships of the days when I wrote "Notes and Notions" for that magazine. I still treasure some of the kind letters I received on the subjects dealt with during the three or four years I wrote the column.'

I assured him that the readers of the PRACTICAL TEACHER were just as eager to renew the acquaintance, and would like to have his opinion on some of the leading questions of the hour—Federation, for example. I knew that as Secretary of the Sub-Association for the Bolton Rural Deanery of the Manchester Federation, Mr. Waddington could speak from inside knowledge, and seemingly that knowledge is not altogether favourable.

'Speaking generally,' he said, 'the Federations are constituted of people who do not believe in education, and who are bent on limiting the public influence of the teacher and the powers of the local managers. The result of the Act of 1897 has been to lower the equipment and staff of many Voluntary Schools, as a consequence of the Federations threatening to refuse to allocate a part of the £620,000 to such schools. The leaders of the Federations in particular localities have publicly and privately intimated to the managers of schools in their districts that the continuance of the present payments to teachers—and especially head teachers—will endanger the grant next year, and this in cases where the teachers are not paid at a higher rate than their colleagues in Board Schools in the same towns.'

'That makes the outlook somewhat gloomy for Voluntary teachers,' I interjected, 'but can the Union do nothing in the matter?'

'Yes, undoubtedly,' was the uncompromising reply. 'The Union will be obliged to take the worst Federation and fight it, both in the interests of education and of the teachers themselves.'

'Now as regards the sectional associations, of which we hear so much. Do you think that these are calculated to injure the Union?'

'No, I do not think they are. Based upon professional specialisation they are rather an advantage to the N.U.T. The serious danger of sectional associations lies in their creation on credal lines. The Assistants' Federation has not only made the Union stronger, but has provided ammunition—in the way of statistics—for driving out of the public mind the idea that every member of the staff, save the head teacher, is a boy or girl. Then look at the work done by the Half-Time Council in ventilating in public the abominable conditions under which children are employed, especially in the North of England. The present state of public opinion in

favour of further prohibition is due to the action of the Union working on the information supplied by the Half-Time Council.'

I looked at the clock, and saw that if strong steps were not taken the rest of the interview would be half-time, and half-time only, and with cordial recognition of the Council and all its works, managed to switch the speaker on to the new method of electing the Executive.

'As to that,' he said, 'there does not seem to be much enthusiasm in the country in its favour, and this is borne out by the practical absence of criticism of the scheme drawn up by the Executive. The position of the officers under the scheme will, I fear, lead to the Union losing the services of those who have invaluable experience of the work, and, in a large measure, the confidence of the teachers. The old system had many defects, but it afforded opportunity for the representation of the various interests included in the Union. It is just possible that, under the new scheme, important, but not locally powerful, interests may fail to secure representation, and this must weaken the influence of the Executive.'

I tried to imagine the Union without its Addiscott's and Macnamara's and Ellery's, and the conversation turned, as a matter of course, to superannuation. Mr. Waddington's face became even more thoughtful than usual, as he explained the present position.

'The long looked for Bill,' said he, 'that has been in the pocket of at least one Vice-President of the Education Department seems to be in serious danger of remaining in the pigeon holes at Whitehall during another session, and I fear that another year's delay may mean the failure of the Government to fulfil the pledge so fully and completely made by responsible members of the Ministry. The chances under another Government will be no better than they were at the commencement of the present Administration. If the Government does not introduce a Bill this session, then the position of the Union will require serious consideration, as there can be no doubt that this failure may possibly mean the shelving of the question for many years.'

MR. R. WADDINGTON.

'I am much obliged, Mr. Waddington,' I said, 'for this full and frank statement, and am sure that the profession will recognise the gravity of the situation. May I beg, now, for a few particulars as to the new ground broken by the Union through the Examinations Board?'

'Certainly,' was the ready reply. 'This is the result of the departure made by the Union at the Manchester Conference, with the idea of ultimately giving the profession some control over the granting of certificates. The work of the Board must lead to increased public influence and the ultimate accession to the Union roll of a large number of those who are at present Pupil Teachers. The fact that the teachers are brought thus early in contact with the Union through its examinations must lead to their final enlistment. I may add that the success of the Examinations Board is due to the enthusiasm and ability of the Honorary Secretary, Mr. A. A. Thomas, who has devoted a vast amount of time and made great personal sacrifices in order to set the Board on a workable basis. Whatever may be the financial deficiency in the early stages, the final result must be a full requitment in the shape of increased public influence and power.'

The sands were running low, and I hastened to put one more question, this time with regard to the Benevolent and Orphan Funds.

'A good deal of heat,' said Mr. Waddington, 'seems to have been engendered by the discussion of the resolution passed at the Swansea Conference requiring the consolidation and simplification of the management of these two funds. Unnecessary suspicion seems to exist in some minds as to the desire of the Executive to capture the funds. I need not say that this suspicion is wholly unwarranted. The only desire of the Executive is to see every teacher a subscriber, and the Orphan and Benevolent Funds an integral part of the Union organisation.'

An electric bell began ringing imperiously; a scurrying of many feet announced that another Committee was under weigh, a glance at the clock, a shake of the hand, and the energetic Vice-President was gone before I had time to thank him for his courtesy.

BIOGRAPHICAL SKETCH.

Mr. Richard Waddington, who will be President of the 39,000 teachers at Cheltenham, entered the profession at Salford, where he served as Pupil Teacher at the Egerton Boys' School. His next school was at Huddersfield, where he was for a time Assistant Master at the Spring Grove Board School, having as colleagues George Sharples and T. J. Macnamara. From Spring Grove to Bolton was but a step, and here as Headmaster of St. James' Mixed School Mr. Waddington has worked for the last twelve years. The Half-Time Champion has bought his experience dearly, for a large proportion of the children in this school are victims of the cruel system.

It is but six years since—at the Leeds Conference—that Mr. Waddington was first elected on the Executive of the National Union; but the keen, clear-cut face and tall, spare figure were destined soon to be well known throughout the length and breadth of the land. The quick, penetrating intellect and infinite capacity for work, the enthusiasm, tempered with sound common sense, marked him out for rapid preferment. As Vice-Chairman of the Education Committee he had full scope for his restless energy, and the profession showed its appreciation by electing him Vice-President at Swansea with over 12,000 votes.

His most assiduous work has been on behalf of the unfortunate child labourer. In season and out of season, at Association and public meetings, and as a witness before the Royal Commission on the Conditions of Labour he has dinned the plain facts into the public, until at length that slow-moving body has begun to think there must be something in it; and it is no exaggeration to say that the present favourable state of public opinion on the question is almost entirely due to his efforts.

At foreign conferences and church congresses Mr. Waddington is equally at home, and those who attended the Nottingham Church Congress will remember his powerful pleading against the proposed limiting of Primary Education. But even the exacting duties of the Executive do not absorb all the Vice-President's energies. He is Secretary of the Sub-Association for the Bolton Rural Deanery of the recently established Manchester Federation, Vice-Chairman of the Bolton Humane Society, and a member of the Rural Decanal Conference. Essentially a worker, Mr. Waddington is a man of whom any professional body may well be proud, and it says much for the discrimination of the members of the National Union, that after such a short apprenticeship he should be called upon to lead the councils of that great organisation.

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CANDIDATES FOR THE VICE-PRESIDENCY, N.U.T.

THE NATIONAL UNION OF TEACHERS.

ELECTION OF VICE-PRESIDENT, 1898.

I.—MR. T. CLANCY.

WHATEVER may be the merits or demerits of the new system of electing the Executive, it at least has the advantage of throwing into greater relief the contest for the 'Blue Ribbon' of the profession; for whilst the ordinary executive member will be elected by a comparatively small constituency, the Vice-President must stand or fall by the votes of the whole country. Four candidates have accepted nomination, but as Mr. Peaker has since withdrawn, the election resolves itself into a 'triangular duel,' as Marryat would put it, between Mr. T. Clancy, Mr. Marshall Jackman, and Mr. J. C. Horobin—names sufficiently familiar to warrant an exciting and interesting struggle.

Mr. T. Clancy, whose public eloquence and private courtesy bespeak his Celtic origin, is a native of Cappawhite, co. Tipperary. His first connection with the profession was made at Plymouth, when he was articled as pupil teacher at the St. Boniface schools. At Hammersmith Training College he distinguished himself both in the examination halls and on the cricket field, his popularity being emphasised by his election as captain of the eleven. On leaving college he was appointed Head Master of St. John's Cathedral School, where for nearly twenty years he has laboured diligently in the cause of education, winning the friendship and respect of all and sundry. Immediately on his appointment he joined the local branch of the Union, and has served as secretary and treasurer. He was thrice President of the Association, and then was elected a member of the Executive at the Cardiff Conference of 1891. Since then his frequent addresses up and down the country have made his name familiar to the teachers. In connection with the late Education Bill, his striking speech at the Queen's Hall, in condemnation of the Government proposals, will be long remembered by the thousands who crowded the vast building on that occasion. Miss Goodwin's struggle with the Southampton School Board, now happily ended in favour of the teacher, enlisted Mr. Clancy's sympathies from the first, and the teachers of the district recognised his efforts by tendering him their public thanks. His work on behalf of the assistants at Portsmouth has further demonstrated his zeal in the teachers' cause, and his assiduous attendance at the House of Commons when Chairman of the Parliamentary Committee, is an earnest of his interest in the Superannuation problem.

During the last year Mr. Clancy has served as a member of the Departmental Committee on the Pupil Teacher question, a position which has necessitated his almost constant attendance in London. He strongly advocates the raising of the status of the teacher, greater security of tenure, and a just scheme of superannuation, and is an equally earnest opponent of Half Time, with all its attendant evils, and of that danger to the profession—the Unqualified Practitioner.

II.—MR. J. C. HOROBIN, M.A.

Mr. J. C. Horobin, M.A., Principal of Homerton New College, Cambridge, holds a unique record of professional experience. He has been pupil teacher, assistant master, Head Master of a small rural school and of a factory half-time school, and is now Principal of one of the largest training colleges in the country. He has been a member of the Union for twenty-one years, and has for ten years been a member of the Executive, where his abilities have had full scope as Chairman and Vice-Chairman of the Law and Education Committees. For six years he represented Hackney on the School Board for London, when he was able to render valuable services in connection with the Corporal Punishment Regulations, Unnecessary Drill Certificates, and the notorious Religious Test Circular.

He has taken a very special interest in the work of the Union's Charitable Funds, and has done six years of good service as a member of the Benevolent Committee and the Central Council of the Orphanage.

His paper on the supply of teachers attracted widespread attention, and was the means of, to some extent, mitigating the evil of which he complained. He believes, however, that the danger is by no means altogether obviated, and would support active measures for further and more efficient control of the sources of supply. To record his activities would be to give the history of the Union for the last ten years. He has borne a prominent part in the agitation for terminating the system of Payment by Results, and for substituting Inspection for Examination. He has taken a keen interest in the

Superannuation question, the organisation of the Law and Tenure work of the Union, the Welsh Intermediate Schools Act, the control by the Union of its own organ, and in the constitution of the Examinations Board.

He is a vigorous opponent of the unqualified practitioner, and deprecates the combining of two departments under one head teacher. He believes that men and women should receive equal pay for similar work in boys' schools, and favours equal salaries for infants' and girls' mistresses. He would secure the abolition of the variable grant, and thinks that the Union organisation could be improved by substituting one subscription to cover all Union benefits.

Mr. Horobin is well known as a writer on educational topics, and as a clear and incisive speaker on many platforms.

III.—MR. MARSHALL JACKMAN.

Mr. Marshall Jackman, the reformer of the Union's finance, pioneer of the Tenure agitation and pamphleteer to the profession in general, is a West countryman. For fifteen years after leaving 'the Boro'' he was an Assistant Master under the London School Board, and has been lately appointed Head Master of the 'Michael Faraday' school. Joining the Union immediately on leaving college, he did magnificent service in the Wimblington case, and was elected a member of the Executive at the Liverpool Conference three years later, heading the poll. Possessing, as he does, a marvellous capacity for work, an unrivalled grasp of figures, and a clear and convincing style of delivery, Mr. Jackman is a redoubtable champion of the teachers' cause, and has won for himself 'golden opinions from all sorts of people.' Mr. Yoxall, speaking at a complimentary banquet given to him on his promotion, declared that 'he regarded Mr. Jackman not only as a magnificent fighting man who had already won his spurs in the political arena, but as a wise and cautious member of the Executive and a leader of the profession'; and the President of the Metropolitan Board Teachers Association, when presenting him with an illuminated address for his services, said that in his opinion 'no man had done more, both on the platform and in the press, for the teachers' cause than Mr. Jackman, their retiring President.'

As Vice-Chairman of the Parliamentary Committee and Chairman of the Organisation Committee, Mr. Jackman has been untiring in his efforts for the advance of the Union, and the continuous advance in the membership speaks well for his administrative powers, while his constructive ability has been shown by his scheme of electoral districts which has been adopted with practical unanimity. The numerous pamphlets he has written place him in the front rank of practical educationists, and it is interesting to note that his compilations played no small part in the recent School Board elections. 'Education and Crime,' 'Superannuation in the 70's,' 'Pedagogue and Policeman,' are some of the best known of these; but his contributions to the educational and general press would need a special catalogue. He has for years been recognised as one of the champions of the Assistants, and although now a Head Master, his sympathies are still with his poorer professional brethren, and he is always at his best in advocating their cause. With characteristic force and brevity Mr. Jackman sums up his policy in the words: 'The Child before the System. Education before Denomination. The Teacher before the Manager. Teaching a Profession.'

Such are the three candidates who aspire to the highest office the Union can bestow, and whatever may be the result of the election, we are at least sure of a responsive echo from every teacher in the country, in wishing them, each and all, a continuance of the health and activity which have enabled them to do so much in the cause of the child and the profession.

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CHELTENHAM.

THE N.U.T. CONFERENCE TOWN OF 1898.

LITTLE more than a century ago, Cheltenham was a straggling village on the banks of a purling stream, which flowed along the middle of the 'High Street,' and was crossed here and there by rude stepping stones. The sudden transformation of this rural market-town to a famous resort of fashion and renown, is probably unique in modern topography. But though the prosperity of the town dates from the Georgian era, it must not be forgotten that in remoter periods it claimed a distinguished existence. This history has been tersely described as one of 'no common or monotonous kind, and abounding with incidents, as interesting as they are numerous and diversified.'

Cheltenham is a place of great antiquity, and its existence has been traced back through eighteen centuries to the time of the pastoral Briton and the conquering Roman. There are distinct proofs that some prehistoric tribe inhabited the district. Excavations have disclosed cromlechs, urns, barrows, circular huts, stone and bone implements, and other evidences of Celtic occupation, while the double-circled earthworks on Cleeve Hill are well worthy of a visit. But while 'the mind of man delights afar to scan the track of ages that have gone before him,' we must not delve too deeply into the visions of the past. Suffice it to say, that the existence of extensive encampments all along the Cotswolds, and the frequent disinterment of coins, weapons, jars, villas and baths, demonstrate that the district was occupied by the Roman legions.

The town is variously described, and its etymological origin is somewhat obscure. Tanner alludes to a monastery founded in 803 standing on a hill. Chilt, in Saxon, signifies an eminence, and 'ham' a village. This was apparently an important monastic centre. 'As true as God's in Glostershire' was a mediæval saying, arising from the number of the priories of the Benedictines.

The Court roll records:—'Cheltenham als Chilteham, als Chiltam is a towne situate on ye northe side of a small purling stream or rivulet called Chilt, from which rivulet ye Saxons gave it ye name of Chiltham, ye word *ham* being the same as ye word *toune* is amongst us.' The cross of Edward the Confessor, on the Borough Arms, refers to the fact that the district—noted for its vineyards—formed part of the possessions of the Saxon king. William, the first of the Normans, like his royal predecessor, was frequently riding in the Vale, and everywhere have the conquerors of the Saxons left traces of their long residence.

Fortunately for the villagers, four centuries passed without any special history. 'Edward IV.,' says Hollinshed, 'entered the town with 3,000 footmen besides cavalry and refreshed themselves.'

During the Civil Wars Cheltenham was the scene of many a skirmish, and relics have frequently been unearthed during building operations, particularly in St. James' Square—the site of the G.W.R. station—and in Imperial Square, where the Winter Gardens now stand—the Conference Hall of 1898.

Ogilby's 'Britannia' in 1675 informs us that Cheltenham numbers 200 houses, hath a fair church, and is six furlongs in extent.

About this time the little market town was in a ferment, owing to a tax being levied on tobacco, which was grown largely throughout the vale.

The weed was doubtless introduced by Raleigh, or Drake, both of whom had some connection with the district. The planters first petitioned Parliament against the tax, and then flatly refused to pay. Royal troops were despatched under Wakefield, with orders to destroy the plantations. The farmers, however, and their adherents, mustered in such force that the military were 'constrained to depart.'

It is worthy of note, that old inhabitants can still remember tobacco plantations on Bayshill, now covered with stately mansions. The old market, founded in 1101, is now occupied by the Plough Hotel—engaged by the Executive of the Union

VIEWS IN CHELTENHAM.

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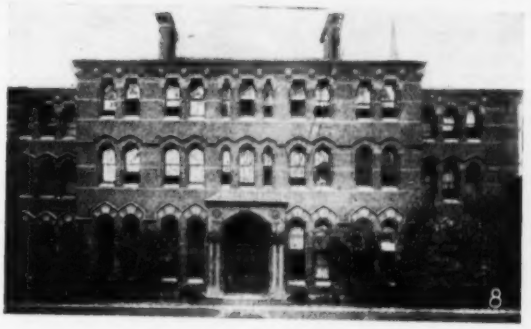
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1. High Street. 2. The Conference Hall. 3. The Ladies' College. 4. Grammar School. 5. The College. 6. St. Paul's College. 7. Dean Close School. 8. St. Mary's College.

for their head-quarters at Easter. Here bull-baiting, cock-fighting, and cudgel matches took place. In an old 'Gloucester Journal' appears the following advertisement, which gives some insight into the habits and customs of the inhabitants :—'Notice is hereby given, that there will be a cudgel match opposite the Plough in Cheltenham on Friday. He that breaks the most heads in three bouts, and comes off clear, to receive a good hat, and a guinea in money ; the second best player a half-guinea ; and every person whose head is broke one shilling. N.B.—Betwixt the hours of 10 and 2 there will be a gown jigged for by the girls.' Another speaks as follows :—'A cock-match by subscription to be fought in Cheltenham Street by the Gentlemen of Gloucestershire. Any person, or persons, may send in their Cocks and may depend upon having particular care taken of them.' The mighty and wonderful transformation from a quaint little insignificant town to the 'Queen of Inland Watering Places,' was due to an accidental discovery of medicinal springs. Tradition ascribes this unfolding of the secrets of nature to flocks of pigeons. At a spot near the present Ladies' College, a spring of saline water discharged itself. Here a flock of pigeons daily resorted, 'for the purpose of feeding on particles of a white salt, casually formed by the heat of the sun.' Curiosity was thus excited in 1716, and it was noticed that even during severe frosts the water continued fluent. Although largely patronised by the people in the immediate neighbourhood, it was not till 1740 that reports and analyses of leading London physicians drew attention to the little town.

To the enterprising spirit of Captain Skillicorne, of the

Pittville Park.

merchant navy, who inherited the property on which the springs had been discovered, the town is deeply indebted. An interesting monument in the parish church perpetuates the memory of Cheltenham's greatest benefactor. He built a dome, provided shelter for the visitors, and secured the spring from all extraneous matter. But the great impetus to the progress of the place was given in 1788, by the visit of King George III., Queen Charlotte, and the Royal Princesses. The *Royal* Spa became its appellation, and countless numbers of rank and fashion flocked to the Well of Health. 'Wealth from the soil uprose—not from a mine of gold and silver, but from Springs Saline.' The royal party remained more than a month. So great was the throng of visitors that accommodation could not be found for them, and the neighbouring towns and villages reaped a golden harvest. The *Morning Post* reports that 'Cheltenham will be the summer village of all that is fashionable—the Cheltenham bonnets, buttons, and buckles being quite the go—the fashions being completely Cheltenhamized throughout the kingdom.' Stamped thus by royalty, the patronage of the fashionable world was liberally bestowed. King George IV., the Dukes of Brunswick, Gloucester, Sussex, and Queen Adelaide honoured the place with their presence, and later visitors included the Duke of Wellington, Handel, Byron, Scott, various members of the French and Russian royal families, the Empress Eugénie, Princess (now Queen) Victoria, and other eminent personages of every rank and degree. New springs were discovered, spas and pump-rooms were laid out and erected, walks and drives planned and planted, groups of terraces, elegant villas and fashionable squares sprang up in all directions. A century ago the population numbered 2,700, in five-and-twenty years it had increased five-fold, and at the present time nearly fifty thousand people reside in the Garden Town—the largest and most important town in the county. While its continued prosperity depends mainly on its educational advantages, it is sometimes forgotten that Cheltenham entirely owes its extraordinary growth to its virtues as a health resort.

Reclining at the foot of the verdant Cotswolds, in a fertile valley, which gently slopes towards the distant Severn, while on the distant horizon the Alp-like Malverns swell—in this romantic and beautiful situation lies the metropolis of the vale. Encompassed on three sides by the hills which rise like an amphitheatre round her, she is protected from the northern blast. Viewed from these heights, the town spreads over a vast area and looks extremely picturesque. 'Not a manufacturing chimney is seen. No polluting smoke veils her graces from the spectator's eye, or defiles her when seen. Built chiefly of stone, she reclines white-robed and easefully on the green plain, and lifts into the pure sky above her nothing but church spire or scholastic tower—signs that characterize her as a place where religion, culture, and refinement hold principal sway.'

Cheltenham occupies nearly 5,000 acres, and thus the population numbers about ten persons to the acre. The town is laid out in lavish style, is judiciously planned and charmingly built, and in the residential portions almost every villa is detached. Stately mansions, elegant villas, groups of terraces, ornamental spas, a promenade only to be rivalled by the 'Unter der Linden' of Berlin, beautiful drives, well laid out squares, and boulevarded roads and streets, with splendid shops, mark the Cheltenham of to-day ; whilst at the beginning of the eighteenth century the parish church, grammar school, almshouses, two markets, a few inns and straggling houses denoted the High Street, and without the line of this main street were farms and pasture lands with all the accompaniments of a rustic life.

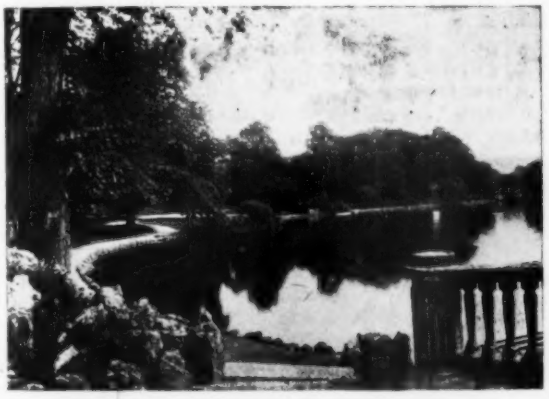
As hundreds of teachers are enjoying the anticipation of an early visit, it is satisfactory to note that the town is singularly easy of access from all parts. From the metropolis, through G.W.R. corridor trains accomplish the journey in three hours, *viâ* Swindon and Stroud from Paddington. Another route from the same place is *viâ* Chipping Norton and Oxford, which takes about the same time. A new connection from Waterloo, by the Midland and South-Western Junction Railway *viâ* Andover and Old Swindon, lands the visitor at Lansdown station in a little longer time. The Midland system connects the Conference town directly with the great towns of the north. Through carriages are run from Glasgow, Newcastle, Leeds, Manchester, and Birmingham. Fast trains from the capital of the Midlands reach Lansdown station in an hour. From Bristol a similar time is taken, and the journey from Southampton occupies three hours. Accommodation is good and plentiful, and the Corporation watch keenly that all lodging-houses are in a good sanitary condition. Hotels and boarding establishments abound, and visitors, whatever their likes and dislikes, may be readily satisfied.

In addition to the natural attractions, every regard is paid to the amusement and recreation of both visitors and residents. As a hunting centre the town is far-famed. No less than eight packs of hounds hunt in the immediate neighbourhood, and the disciples of Nimrod contribute largely to the prosperity and 'life' of the place during the season.

Golf, on the Cleeve Hill Links—3½ miles away—commands increasing attention. Frequently they are visited by the present Leader of the House of Commons, who writes of the great pleasure he derived while playing through the magnificent scenery of Cleeve Cloud. Followers of the ancient and noble game muster in goodly numbers, and while engaged in the exhilarating pastime, can see down in the vale on a clear day the towers of Gloucester and Worcester cathedrals, Tewkesbury Abbey, and across the twenty miles of valley, Malvern town ; in the opposite direction may be descried Winchcombe, the ancient capital of Mercia, and the feudal castle of Sudeley.

Too numerous are the various kindred sports and pastimes to enumerate, but it may be mentioned that Cheltenham has provided many champions among Toxophilites, whose ground

is the finest in the Midlands. The votaries of the wheel are numberless, and it will be welcome news to teacher-cyclists that the roads are good and the gradients easy. For those on pleasure bent, but less actively inclined, there is a new theatre and opera house in Regent Street, replete with every modern convenience, and occupied by the best companies out of London. Clubs of all kinds open their doors to welcome visitors. The political clubs, both Conservative and Liberal, dwell almost side by side, and extend hearty invitations to all teachers



PITTVILLE LAKE.

during Easter week. The colleges and schools are the largest and finest buildings in the town, with the exception, perhaps, of the Public Library in Clarence Street, built in 1887 to commemorate the Jubilee of Her Majesty Queen Victoria. But of these more anon.

The Assembly Rooms, in the High Street, were opened by the Duke of Wellington in 1816. Here the N.U.T. Conference of 1888, under President Pope, met. The famous ballroom is in constant use from Christmas to Lent, and dances and receptions are among the brilliant functions of the season. The suite of rooms will be requisitioned on more than one occasion for the Conference gatherings. Almost opposite is the Corn Exchange, where the temperance breakfast will be given. This is thronged on Thursdays—the market day—by the surrounding farmers.

The Winter Gardens are situated in the upper part of the promenade. They are now the property of the Corporation, who readily placed them at the disposal of the Local Committee. The grounds are about three acres in extent, and are being carefully laid out. The huge cruciform building is of glass and iron, and is used for skating, and concerts are given daily. A more delightful spot in summer it would be difficult to find. At the summit of this famous walk—the chief glory of the town—stands the imposing Queen's Hotel, with its grand portico and arcade in imitation of the Temple of Jupiter at Rome. In front are two Russian guns surmounted by laurels and lamps. Inscribed on the pedestals supporting them are the names of local heroes who fell in the Crimea. From this eminence a splendid view of the triple leafy avenue is obtained. This always was, and it remains, the heart of fashionable Cheltenham. Thus writes the *Daily Telegraph* in May last: 'Though the beaux and belles of Lytton, Thackeray, and Lever's days no longer stroll along its broad *trottoirs*, under the double avenues of chestnuts, limes, acacias, and elms, the roll of carriages on a bright day is incessant, the succession of lady cyclists constant, and the business done at the imposing emporia quite satisfactory, even if their 'caps and buttons' are not, perhaps, so powerful as of old to Cheltenhamise the fashions as they certainly did in King George's reign, there is no decline in the prosperity of the promenade. Its buildings belong, no doubt, to the stucco age, and have, consequently, not many architectural beauties, but the fountains, the green swards, and the trees compensate for this shortcoming, and a saunter may be as enjoyable here as along the Champs Elysées, and twice as invigorating as at limp and languid Wiesbaden.' Suspended over the centre of the roadway, hang, among the branches of the trees, powerful electric arc lamps, and the scene on a summer evening is, indeed, charming. Behind the promenade fountain, where Neptune and his Tritons may be seen, are the Imperial Rooms —formerly used as a Spa—the reception rooms for the Conference. Here a glimpse of the famous Ladies' College may be gained, with which, and its kindred institutions, we will deal later.

Of the Spas, Montpelier and Pittville deserve special attention, both of them being the property of the town. The former, with its spa Rotunda, is situated at the south end of the promenade. The building is an Italian-style edifice, with a colonnade, which supplied an agreeable place for a 'constitutional' in doubtful weather in the days of the water-drinkers. It is now largely used for 'at homes,' dances, and concerts.

The acres of well-laid out gardens lend additional attraction to this delightful neighbourhood, which has been said to resemble the Passy Quarter of Paris from its miniature boulevards and avenues. But the soft beauties of Pittville on the north side of the town rival Baden-Baden itself. Crossing the busy High Street, a few minutes' walk brings us to the beautiful park. Sixty acres of walks and drives, lawns and leafy avenues, lakes and groves, are open to us. Over the ornamental bridge, which crosses one of the willow-hung lakes, we saunter along a sylvan drive towards the handsome Temple of Hygeia, with its arcades and lofty dome. Here we may drink of the healing waters which made, and uphold, the reputation of the town. By a subway the Marle Hill portion of the park may be visited; here is a boating lake, which has the appearance of a winding river, while the wild-looking character of the scenery, the bamboo bridges, and the umbrageous and diversified prospect create a charming impression. Returning to the town, we notice avenues of trees in every direction.

It will, then, be easily understood why Cheltenham is such a favourite resort. The salubrity of its climate is especially suitable for old Indians and colonials, who form a good proportion of its chief residents.

The town's ecclesiastical wants are well supplied. There are numerous churches and chapels, most of them very handsome buildings, but for the most part, modern examples.

But a notable exception is the venerable parish church of St. Mary, erected in the eleventh century. Its large dimensions and structure denote that Cheltenham was at that time an important ecclesiastical centre. It is now hemmed in by houses, and thus its grand proportions cannot be fully appre-

NEW LAKE, PITTVILLE PARK.

ciated. Always open to the public, representatives should make an effort to visit this—the last vestige of the ancient town. It teems with interesting inscriptions, monuments, and other memorials of the past, while the stained windows are alone worthy of special inspection. Unfortunately many relics have ruthlessly disappeared—a large and ancient font became a watering-trough at 'The Sun' in Lower High Street! The Mary-gold window, the piscinas, chantries, and the parvise,

Next Month's Articles:

How to Cycle to Cheltenham at Easter.

Education in Cheltenham.

or priest's chamber, are worthy of note, and of the stone coffins, the ball-flower roof, the tombs and brasses, a history might be written.

Among many curious inscriptions in the well-tended churchyard, the following is plainly recorded :—'To the Memory of John Paine, Blacksmith. Died 1796.

> 'My sledge and hammer lies reclined,
> My bellows-pipe has lost its wind ;
> My fire's extinct, my forge decayed,
> And in the dust my vice is layed ;
> My coal is spent, my iron's gone,
> My nails are drove, my work is done.'

The next stone is erected to the memory of 'J. Higgs, Pig-killer,' and collectors of epitaphs will find thereon a very quaint inscription.

Of famous 'footsteps in the sands of time' Cheltenham is not wanting. Besides the eminent personages before mentioned, we note that Byron resided in Cambray, and Campbell at Montpellier. Wilderspin formulated the infant school system at Alpha House, Bayshill, where, too, Dr. Jenner first practised vaccination. Tennyson lived for about two years in St. James's Square, and Tom Moore, Mrs. Craik, and Sydney Dobell were residents. Many of these have extolled the town in their writings, and made the Chelt as renowned as the Tiber. But its latest illustrious visitor, H.R.H. the Prince of Wales, in 1897, said :—

> 'I shall retain a most agreeable recollection of my visit to a town so celebrated for its beauty as Cheltenham. It gives me much pleasure to come here.'

With the sincere hope that the representatives will have good cause to likewise return thanks, with fraternal wishes, we say 'Au revoir.'

RECREATIVE TRAVEL PAPERS BY PRACTICAL TEACHERS.

III.—FLORENCE.

THE highly interesting account of a visit paid to the famous 'city of flowers' by the writer of the paper on Rome in our last issue will, we feel sure, afford much pleasure to our readers, whether they be of those who have already shared in such a delightful pilgrimage or of those who are looking forward to such an experience in the future. Those also who limit their holiday journeys to the health resorts and beautiful spots in the home country may nevertheless enjoy reading of the impressions made upon a teacher by a visit to a city of such wonderful and varied interest.

One of the greatest and most fruitful of the educational advantages resulting from this kind of travel is the new light which is constantly thrown upon history, art, literature, and religion by the objects which come under notice ; and another is the stimulus which is given to reading for the acquisition of further information on the many topics suggested to the mind of the traveller.

In introducing the paper on Rome we specially commended the little bibliography with which the writer concluded. As this useful feature has not been included in the present paper, we venture to name a few works of interest on Florence by way of supplying the omission.

'Walks in Florence,' by Augustus W. Hare, the matter of which has been incorporated, we believe, in the smaller book on 'Florence' by the same author.

'Makers of Florence,' by the late Mrs. Oliphant, a work of great charm and insight, perhaps the best of the series produced by that gifted writer on the history of famous cities.

'Mornings in Florence,' by John Ruskin, a book almost essential to an intelligent appreciation of the great works of art in which the city abounds. The same great writer's 'Val d'Arno' treats further of Florentine art and history.

'Romola,' by George Eliot, a novel which embodies the results of a most painstaking study of Florence during a remarkable period of its history.

'Florentine Mosaics,' by W. D. Howells.

'John Inglesant,' by J. H. Shorthouse, and Ouida's 'Ariadne,' were included, we believe, among the books recommended to members of the Toynbee Travellers' Club as containing matter of interest to visitors to Rome and Florence.

SAVONAROLA.

'Casa Guidi Windows,' by Mrs. Browning, and many of the poems of Robert Browning, are full of the atmosphere of the city to which they relate, the city which was so long the home of these great poets.

Thomas Adolphus Trollope's 'History of the Republic of Florence' is somewhat too bulky and heavy for the ordinary reader ; but much information might be gathered from a perusal of the part relating to Florence in Sismondi's 'History of the Italian Republics,' of the 'History of Florence,' by Niccolo Machiavelli, and of Mr. Oscar Browning's recent work, 'Guelphs and Ghibellines.'

> 'O Florence, with thy Tuscan fields and hills,
> Thy famous Arno, fed with all the rills,
> Thou brightest star of star-bright Italy.'
>
> COLERIDGE.

Florence in spring is perfect in its loveliness. Around it are the vineyards and olive trees, and the song of the nightingale haunts you day and night. So beautiful a city is this

Florence that Charles V. said 'she was fitting to be shown and seen only on holidays.'

Charles Lamb says that he is 'disposed to say grace upon twenty other occasions' besides dinner. He craves a form of grace upon setting out on 'a moonlight ramble, for a friendly meeting, or a solved problem,' 'a grace before Milton—a grace before Shakespeare,—a devotional exercise proper to be said before reading the "Fairy Queen."' I want a very special grace to be said upon entering the city of Florence.

We spent the night at Pisa, and came on to Florence in the early morning. True, we did the journey in a prosaic railway train, but we sped through fields and gardens gloriously rich with flowers, and we drove slowly from the railway station to our *pension* on the Lung' Arno. This was Florence, the Florence we had dreamed of a thousand times, 'the fairy city' of our heart. It was a gala day, and the winding, dusky, irregular streets, 'with the outlines of their loggie and arcades, and the glow and colour that fills their niches and galleries' were crowded with eager Florentines intent on a festival. The throngs of people that pressed close against our carriage as we drove slowly through them were 'the same in likeness as those that brushed against Dante; the same bold, vivid, fearless, eager people, with eyes full of dreams, and lips braced close for war, which welcomed Vinci and Cimabue and fought from Monteaperto to Solferino.' At every step some touch of the gracious past met us: here a vista of Romanesque arches in some dim palace court, and again a bit of coloured fresco on a wall, or a quaint bas-relief on a lintel; presently we found ourselves in the square of the Cathedral and the Duomo, with the Campanile of Giotto and the Baptistery close upon us. The wonderful group of buildings, the perfect architecture, the gleam of the marbles, the bronze gates flashing in the sunlight, and the crowds of peasants and Florentines around, buying, selling, and chattering, made an impression never to be forgotten.

BRIDGE CROSSING THE ARNO.

'About the Duomo there is stir and strife at all times; crowds come and go, men buy and sell, lads laugh and fight; piles of fruit blaze gold and crimson; on the steps boys play at dominoes, and women give their children food, and merrymakers join in the carnival fooleries; but there in the midst is the Duomo, all unharmed and undegraded, a poem and a prayer in one, its marble shining in the upper air, a thing so majestic in its strength, and yet so human in its tenderness, that nothing can assail and nothing equal it.'

'Of living Christian work none is so perfect as the Tower of Giotto,' says Ruskin. 'That bright, smooth, sunny surface of glowing jasper, those spiral shafts and fairy traceries, so white, so faint, so crystalline, that their slight shapes are hardly traced in darkness on the pallor of the Eastern sky; that serene height of mountain alabaster, coloured like a morning cloud, and chased like a sea shell.'

> 'In the old Tuscan town stands Giotto's tower,
> The lily of Florence blossoming in stone,—
> A vision, a delight, and a desire,
> The builder's perfect and centennial flower,
> That in the night of ages bloomed alone.'
>
> LONGFELLOW.

We just caught a flash of the Baptistery bronze gates of Ghiberti amid the surging crowd as we drove slowly on, and were reminded of Michael Angelo's remark that 'they were worthy to be the gates of Paradise.'

Presently we were passing the Loggia de Lanzi, and we caught a glimpse of Donatello's Judith in bronze, and in the Piazza della Signoria the various scenes in the life of Savonarola rushed into our memories. Here the pyramid of vanities was erected in the enthusiasm which followed his preaching, and repentant Florentine beauties cast their trinkets, perfumes, and beads into the flames, while fanatical lovers of art were moved to throw rare pictures, busts, and even a Petrarch or Boccaccio inlaid with gold into the great pyramidal bonfire. Here too is the stone platform where the judges sat on the memorable May 23rd, 1498, when

> 'Savonarola's soul went out in fire.'

But these memories vanished at the first glimpse of the Arno—

> 'Of golden Arno as it shoots away
> Through Florence' heart beneath her bridges four:
> Bent bridges, seeming to strain off like bows,
> And tremble while the arrowy undertide
> Shoots on and cleaves the marble as it goes.'
>
> MRS. BROWNING.

The houses on the bank of the Arno are 'bright with soft tints of colour, irregular, picturesque, various with roofs at every possible elevation—the outline broken with loggias, balconies, quaint cupolas and spires.' The Arno below reflected everything on its golden bosom—the cloud on the blue sky, the overhanging windows—and gave that touch of colour, sunshine, and warmth which we always associate with a Tuscan town.

It was in one of these houses on the Arno that we took up our abode. We were welcomed cordially, and led through cool, dusky passages into a room which, to my bitter disappointment, did not overlook the Arno. Then we were advised to hurry back to the square with all speed, for the dove was to issue from the altar of the Duomo on the stroke of twelve, and we had just time to see it. So we ran quickly along the streets in the glittering sunshine to the great square, which was thronged with all sorts and conditions of Florentines and a good sprinkling of sight-seeing American and English strangers. Ladies in silks stood on the steps of the shops and craned out of upper windows; picturesque peasant women and men, boys and girls pressed close around the Cathedral and swarmed on the steps. The interior of the church had been packed, we were told, from six o'clock in the morning. Why there was a dove, and what it was going to do, I had not the faintest idea; but presently I heard great shouts and cheers from the crowd, and simultaneously the deafening noise of a hundred fireworks all going off together.

Then the cheers redoubled, and the crowd began to melt away in high good humour. Everybody congratulated everybody else, and the good fortune of the place seemed to be established. I was thankful to the crowd for moving on, it enabled me to look closely at the beautiful sculpture and precious marbles which adorned the exterior of the cathedral; but as I was curious to know the cause of the rejoicing, I asked a shopkeeper, and was told that the dove had flown straight from the altar and had touched a wire which had set off the fireworks. This indicated a prosperous year and successful harvest. I learned afterwards that this was one of the old customs which seem to bring the dim ages of the past so close to you in these Italian cities. I strolled through Florence alone, and tried to become acquainted with it. To do this you must wander through its streets, and watch the life of the people. Here in a cobbled alley through an ancient gateway is a dusky smith's forge, and a woman with a coloured handkerchief over her head and a bunch of spring carrots in her hand is talking to the smith. Here in the wood-seller's shed are two brown liquid-eyed children, with naked feet, buying wood;

and here on the goldsmith's stall on the Ponte Vecchio is a Renaissance seal ring. The past is everywhere associated with the present in Florence—you cannot dissociate them. 'Buy eggs in the market and you buy them where Donatello bought

MADONNA (RAPHAEL).

those which tell down in a broken heap before the wonder of the crucifix. Stray into a dark church at evening time, where peasants tell their beads in the vast marble silence, and you are where the whole city flocked, weeping, at midnight, to look their last upon the dead face of their Michael Angelo. Buy a knot of March anemones or April arum lilies, and you may bear them with you through the same city ward in which the child Ghirlandajo once played amid the gold and silver garlands his father fashioned for the young heads of the Renaissance. Ask for a shoemaker, and you shall find the cobbler sitting with his board in the same old twisting shadowy street-way where the old man Toscanelli drew his charts that served the fair-haired sailor of Genoa called Columbus.'

I wanted to spend weeks in strolling through Florence before I began to see the sights, but that could not be. I had only three days to spare, and then I must go back to England to superintend the examination of young students who aspired to become teachers. We are dreadfully shortsighted in the way we make teachers; we shut them up in class-rooms and lecture-rooms for two or three years, and pour streams of information upon them. Some of it they retain long enough to give it out second-hand in their examination papers. Then we classify them, and send them out into the world to go on pouring streams of information in their turn upon classes of unfortunate children. If we would only realise that information does not matter, but that the power to see beautiful things and to recognise beautiful deeds and to live beautiful lives is the essential part of all education and training, we might hit upon happier methods. Why, for instance, should we not send the student who aspires to teach to one of these old Italian cities for six months or more, and say to her, 'See things for yourself'? Her teaching would be worth more afterwards than if she sat in a class-room taking notes all the time. But she gets certificates and diplomas if she takes notes diligently, and remembers some of them and puts them in her examination paper, whereas she gets nothing if she goes to Florence and sees things for herself, so she goes on sitting in lecture-rooms. This is a digression, but it came into my head as I lingered on the Ponte Vecchio, and I think it ought to be recorded.

The next day I began to see sights sparingly. I began with the Uffizi Gallery, and I only attempted to see a very few things. I passed the bust of the Medici, and the busts of the Roman Emperors, and two or three corridors, and made my way to the Tribune, where is enshrined the Venus de Medici which was found at Hadrian's Villa at Tivoli.

'The goddess loves in stone, and fills
The air around with beauty,'

says Byron. We cannot understand the charm of this perfect figure at once; but to those who have lived with her, in the sense of having her picture on their walls, she brings satisfaction. 'One cannot think of her as a senseless image, but as a being that lives to gladden the world, incapable of decay or death; as young and as fair as she was three thousand years ago, and still to be young and as fair as long as a beautiful thought shall require physical embodiment.' Titian's Venus seemed to me coarse in comparison; there is a subtle beauty about the Venus di Medici which seems to appeal very powerfully to women. I shall say nothing further about the treasures of the Uffizi. I am conscious that it would take weeks to study them.

The next day I spent two hours in the Pitti Palace, and looked at a few pictures I had longed to see for years. Raphael's Pope Leo X. and Julius II. did not disappoint me, and the colouring of his Holy Family and Madonnas satisfied me. The Madonna Gran-Duca especially has a wonderful charm; one wants to visit it constantly to learn it, in spite of its simplicity.

Michael Angelo's 'Fates' are characteristic, and one wants to meditate before them and read the riddle one's own way. I found the picture of Andrea del Sarto and his wife Lucrezia which prompted Browning to write his poem, and I realised why he makes the painter say—

'All is silver-grey
Placid and perfect with my art.'

The Botticellis, Dürers, and others there is no use in

RAPHAEL'S PORTRAIT OF HIMSELF.

describing. Each must see for himself and learn from them what they impart to him. One must do one's own seeing and thinking if one is to gain anything, just as one must do one's own eating and sleeping.

I saw Michael Angelo's figures of 'Dawn and Twilight' and 'Day

Next Month:
An Illustrated Article on
EDUCATIONAL TRAVEL IN SPAIN.
By a Practical Teacher.

and Night' at the tombs of the Medici. They appear disproportionate and terrible; it is difficult to admire them at first, the casual sightseer is inclined to laugh at them. Says Mr. Browning—

'Three hundred years his patient statues wait
In that small chapel of the dim St. Laurence;
Day's eyes are breaking bold and passionate
Over his shoulder, and will flash abhorrence
On darkness, and with level looks meet fate,
When once loose from that marble film of theirs;
The Night has wild dreams in her sleep, the Dawn
Is haggard as the sleepless, Twilight wears
A sort of horror.'

'They are all wrong,' says a critic, 'full of defects, impossible, unnatural; but they are grand thoughts and mighty in their character, and they overawe you into silence.'

The Westminster Abbey of Florence is the church of Santa Croce. Byron says—

'In Santa Croce's holy precincts lie
Ashes which make it holier, dust which is
Even in itself an immortality.
. . . . . here repose
Angelo's, Alfieri's bones, and his
The starry Galileo, with his woes;
Here Machiavelli's earth, return'd to whence it rose.'

In the Piazza Santa Croce is the statue of Dante.

'Tender Dante loved his Florence well,
While Florence now to love him is content,'

says Mrs. Browning.

In the Via Ghibellina we suddenly come upon the house of Michael Angelo Buonarroti, which now belongs to the city of Florence. The table and crutches of the great master are to be seen in his little study.

The church of San Marco is chiefly associated with the names of Savonarola and Fra Angelico. In the cloisters are six frescoes of Fra Angelico, and the walls of the convent and the cells of his friends are covered with his paintings. 'He worked continually in his art; nor would he ever paint other things than those which concerned the saints.' Within the Prior's Cell are two small cells which were occupied by Savonarola. Here are to be seen his hair shirt, rosary, and a fragment from the pile on which he was burnt.

The third day I went to the Gardens of Boboli on the opposite side of the Arno. These gardens are on a height which commands a view of Florence and the valley of the Arno. This is how Shelley describes the view: 'You see below you, Florence, a smokeless city, its domes and spires occupying the vale; and beyond to the right the Apennines. The green valleys of these mountains, which gently unfold themselves upon the plain, and the intervening hills covered with vineyards and olive plantations, are occupied by villas, which are, as it were, another city of palaces and gardens. In the midst of the picture rolls the Arno, through woods and bounded by the aërial snow and summits of the Lucchese Apennines. On the left a magnificent buttress of lofty craggy hills, overgrown with wilderness, juts out in many shapes over a lovely vale and approaches the walls of the city. The vale below is covered with cypress groves. The Cathedral with its marble campanile and the other domes and spires of Florence are at our feet.'

I am conscious that this sketch of Florence is as imperfect as my own hasty visit, which only aroused in me an intense desire to go again and see this 'beautiful and stately city' at my leisure, for I am convinced that it is the most beautiful and the most interesting city in the whole world.

THE CATHEDRAL AND CAMPANILE.

OUR SEARCHLIGHT COLUMN.

INTRODUCTORY.

IN our Editorial Notes of last month we quoted a letter from a lady subscriber, who, finding it impossible to wade through the columns of the daily newspapers, and recognising at the same time how desirable it is that teachers should be acquainted with what is going on in the world, suggested that we should supply this want by giving 'an epitome of current events such as would be useful to teachers.' The idea of doing this in some form has long been under consideration, and with this number we make a beginning.

At the outset we cannot shut our eyes to a difficulty which arises from the very nature of the need which is felt. The newspapers provide more material than busy people can find time to read, or even to glance over, and with improved means of communication fuller details of events in all parts of the world are ever more speedily collected and prepared for distribution. We know, too, that many teachers, by the very conditions of their employment, are obliged to live out of the current of the busy world. They are shut out from the talk on public matters for which great towns afford facilities. Still they are impressed with the importance of their being abreast of the times in their knowledge of current history. Our difficulty is how to present the essential points in the space which can be spared for the purpose. It can only be met by careful selection and compression.

A Newspaper Class.

In a remarkable address delivered by Mr. John Morley at the opening of the Passmore Edwards Settlement in Tavistock Place—an institution intended to do for its own neighbourhood what Toynbee Hall does for Whitechapel—a passage occurs which we quote as bearing on the object before us. The speaker was suggesting 'a newspaper class' to be held every night for the elucidation of the day's news, and said—

'If you take to-day, or any day, a copy of the *Times* or any of the great morning sheets, you will find an enormous field of historical, geographical, social, economical interest and knowledge open which will deserve fuller attention and fuller development, and from which I fear most people do not derive such advantage as they might. For example, I wonder in this distinguished audience that I have the honour of addressing how many there are who can draw a sketch map of the north-west frontier of India, and mark upon it the Kyber, the Golan, the Bolan, the Kobat, and other passes! Who could tell how far it is from the Malakand Fort to Chitral? It would be interesting if there was a class here and a professor who would explain these matters, and explain to the students what all these controversies are about. . . . . Take another thing. You have read of the unfortunate doings in the Reichsrath in Vienna. Now if anyone would take up the telegrams from Vienna you will find in them a topic for discussion which would be in the highest degree instructive.'

Now all this is very true, but we feel that our task is quite as important as that of the teacher of Mr. Morley's suggested class, and perhaps more difficult; for it is to condense and at the same time make clear the news to those whom circumstances prevent from reading at length in the papers. Hence it is that we must be eclectic and brief. Many events will have to be passed over and very few can be dealt with in detail.

At the present moment the newspapers present a wonderfully wide and varied field for the teacher of geography. In nearly every part of the world events of general or critical importance are happening. This will appear from the following summary :—

The North-west Frontier of India.

At the opening of the New Year came the news of the death of Sir Henry Havelock-Allen, M.P. for South Durham, who was shot by some Afridis near Ali Musjid in the Khyber Pass. The revolt of the semi-barbarous tribes on the North-west frontier of India last autumn, whether it arose from fear of molestation or from other causes, has resulted in much bloodshed and anxiety as well as enormous expense. It was considered necessary to organise a punitive expedition, and the different bodies under British command have displayed great bravery and achieved some successes, balanced, however, by serious reverses. The Tanga Pass was captured Jan. 7th, but a British column suffered severe loss in the Bazai Valley on the 29th. The mountainous country traversed by the great passes is most difficult for an invading force and affords the utmost advantage to the native tribes acquainted with the rocks, gorges, and recesses which abound. In January also a British survey party in the neighbourhood of the river Desht in Baluchistan was set upon and cut up.

China and Europe.

Much attention has been turned to the Far East. In December last a German fleet left Kiel for China, one of its objects being to make a demonstration for the protection of German missionaries in China, some of whom had been murdered. Another object was to secure advantages for German trade. The Russians occupied Port Arthur to the north of the Gulf of Peche, and the Germans occupied Kiao-Chow, a port further south. The British Government, anxious to secure a share of the trade with China, has declared for 'the policy of the Open Door,' that is, that all ports of China thrown open to foreign trade shall be open to all foreign countries alike. In support of this policy our fleet in Chinese waters has been strengthened. Some amount of international jealousy has been displayed in connection with a proposed Chinese loan. China, owing a heavy indemnity to Japan, as a result of the late war, is anxious to pay it off. Great Britain and Russia have been ready to lend the £12,000,000 needed on certain conditions. A strong foothold in China seems to be the chief condition on the part of Russia, and open ports in the case of Britain. The negotiations do not appear to be concluded.

The Nearer East.

In the nearer East a disturbed state continues. The treaty of peace between Turkey and Greece was signed on December 4, but disturbances have taken place in Thessaly, and Crete is still without a governor. The candidature of Prince George of Greece is strongly favoured by Russia, and is approved by England and France ; but up to the present the Sultan declines to accept Prince George, and the German Kaiser is understood to support the Sultan. Fresh Turkish atrocities are now reported in Bulgaria, and there seems to be a probability of Russia interfering in a decided manner.

Troubles in West Africa.

For some time past there have been signs of trouble in West Africa—again through international jealousy. There are some outstanding differences between France and England on the boundaries of what are called their respective spheres of influence in the hinterlands of Lagos and the Gold Coast. While the matter is under consideration, there seems to be some fear of collision between the forces which are engaged in protecting the disputed positions.

Another interesting note on Africa is that Oom Paul Kruger was in February re-elected President of the Transvaal Republic by a great majority over two other candidates. It is, however, pointed out that a large and important section of the population, namely, the Uitlanders, or Outlanders, have no votes. This, it is alleged, is one of the chief causes of dissatisfaction there.

Klondyke.

The name of Klondyke has become very familiar within the last few months. It is a very rich gold-yielding district not far south of the Arctic circle in the extreme west of British America, and very near the borders of Alaska. The place is remarkably difficult of access, because of the rugged mountainous nature of the way to it, and the extreme cold which has to be endured on the way. Another difficulty is that of the food supply for the large population which the keen thirst for gold has drawn thither. The chief place is Dawson City, and the best way to it at present seems to be by an opening called the Lynn Canal to the north of the island of Sitka, then from Skagway over a lake-strewn district to the river Lewis, and down this river for some 600 miles. The navigation of the river is difficult on account of its rapid current, its shallowness, and numerous rapids. To return by the same route is impracticable, and the best way back is said to be down the river Yukon to Behring's Sea, a distance of about 1,800 miles, also difficult of navigation, and passing through the inclement climate of Alaska. Troubles about boundaries and means of access are already talked of between Britain and the United States. Negotiations for making a railway are in progress. It is said that in the short hot summer mosquitoes and other such pests are as much to be dreaded as the terrible severity of the long winter.

Parliament and the Queen's Speech.

We ought to chronicle that Parliament reassembled on February the 8th, that a greater number than usual of new members had been elected in the recess, and that the crop of solecisms in the Queen's speech was fully up to the average. Her Majesty was made to describe the estimates somewhat redundantly as '*beyond former precedent*,' then to refer to '*an unanimous voice*,' and use *elsewhere* as correlative to 'a portion of the Afridis.'

Personal Notes.

Among the deaths recently recorded are those of the Hon. C. P. Villiers, father of the House of Commons, who had sat for Wolverhampton continuously since 1835, and had entered on his 97th year ; Dean Liddell (86), known as joint author of Liddell and Scott's 'Greek Lexicon' ; the Rev. C. L. Dodgson (Lewis Carroll), author of 'Alice in Wonderland' ; Mr. George Dixon, M.P., eminent as an educationist ; Mr. Ernest Hart, an active sanitary reformer ; Miss Frances Willard, temperance reformer ; and Sir James Stansfeld, a noted Liberal politician.

Of eminent men still with us, we may record that Mr. Gladstone, who has been spending two months at Cannes, has just returned to London on his way to Bournemouth. His sufferings from acute neuralgia have been a matter of much concern to his friends, indeed to the whole country. We are glad to hear he has come back better.

On Feb. 8, Mr. Ruskin celebrated his 79th birthday. 'Though he no longer wields the pen, he is in good health,' and Mr. George Allen, his publisher, has just issued a new volume of lectures given by him many years ago. To the *Daily News* of Feb. 8 the Rev. H. D. Rawnsley contributed the following sonnet :—

To John Ruskin, on his 79th Birthday.

Born in our monster Babylon, to decree
The blasting of all Babylons—and ordained
To be her avant-courier who has reigned
Longest and best—we give God thanks for thee.

Tho' conquering hosts encompass land and sea,
And men of arms her Empire have maintained,
Thou art her mightiest warrior, thou hast gained
By power of wisdom wider sovereignty.

Wherefore to thee, for whom this day has brought
The golden crown thy eightieth year shall wear,
We bring the tribute of our love and praise,
And borne from far-off centuries we hear
Proud acclamation of the seer who wrought
Undying splendour for Victorian days.

Our Monthly Retrospect

EDUCATION IN ENGLAND.

I.—N.U.T. NOTES, &c.

BY T. B. ELLERY, F.R.G.S.,

1895-6 *President of the National Union of Teachers, Chairman of the Teachers' Benevolent Committee.*

Superannuation and the Queen's Speech. Much disappointment will probably be felt by a very large number of teachers that the subject of superannuation for teachers in primary schools was not mentioned in the Queen's speech. Very few of those, however, who have been working early and late in connexion with this matter, expected to find any reference to it in that speech.

After all, as my readers will see if they give it a moment's thought, superannuation is hardly a subject of sufficient national importance—from the ordinary point of view, at any rate—to call for this special distinction. Let no one imagine, however, that the absence of any mention is a bad omen, for it is nothing of the sort.

We have every reason to believe that the long-looked for Bill will be introduced this year. I have said so in these columns on more than one occasion, and I repeat the statement. Nothing has occurred to alter my opinion, nor the opinions of my colleagues on the Executive. Messrs. Yoxall and Gray are as hopeful as ever, and it is an open secret that negotiations have been proceeding with a view to expedite matters.

To those who have written to me, I can only say there is no cause for despair. *No rash, ill-judged step must be taken.* That I say with a full sense of the responsibility we have taken upon ourselves.

The 'leader' in the *Schoolmaster* of the 12th February put the position fairly and clearly; it should be read by all who are interested in this (to teachers) all-important question.

Miss Goodwin's Victory. To be dismissed from the post of head teacher by the School Board, to win a seat upon that School Board at the election following soon after the dismissal, and finally to be reinstated in the position of head teacher, is probably an experience which few have 'enjoyed'! Miss Goodwin is to be congratulated upon her success, for that has been *her* experience at Southampton. To myself the good news is particularly gratifying, for it was my privilege to take part in the 'battle' in the early days. As an officer of the Union I was sent to Southampton to present to Miss Goodwin publicly a testimonial in the name of the N.U.T., and I am not likely soon to forget the magnificent demonstration then made on behalf of a teacher unjustly dismissed. Some excellent speeches were delivered by men of all shades of thought, the best being that of my friend and colleague, Mr. Clancy, who in conjunction with Mr. Organ, made a splendid fight for fair play and justice. For weeks these two men laboured unceasingly, and now that victory has rewarded their efforts, they, as well as Miss Goodwin, deserve our hearty congratulations. It is another triumph for the Union, of which all concerned may well be proud. Miss Goodwin's reply to the vote passed by the Executive at its last meeting was just what one would have expected from her. It was an elegant little speech, and I need hardly say it was received with enthusiasm.

Every teacher in the land will wish the lady God-speed in her work at Southampton. One thing is certain—she deserves to succeed. The PRACTICAL TEACHER joins in hearty congratulations to Miss Goodwin and to all who have helped to bring about so remarkable a victory!

An Executive Disclaimer. The solution of the primary and secondary school problem has not yet been found, nor are all parties likely to be agreed, at least for some years to come. The Association of Head Masters in Higher Grade Schools, and Schools of Science, has recently been working under the protecting wing of the N.U.T., but it has also had some dealings with the Incorporated Association of Head Masters, with the result that some misunderstanding has arisen. Not wishing to be saddled with the responsibility of what had taken place, the Executive of the N.U.T., at its last meeting, passed the following resolution:—

> 'That the N.U.T. is not involved in the opinions and conclusions expressed in the joint memorandum on the relations of Higher Grade and Secondary Schools, which owes its existence alone to the Association of Head Masters in Higher Grade and Schools of Science, and to the Incorporated Association of Head Masters.'

A Sustentation Fund. Everybody is agreed that something must be done to improve the salaries of those teachers who are working in the nation's schools on miserable pittances, which an illiterate and unskilled mechanic would scorn to take in return for his services. But it is a very difficult problem. A policy which did not commend itself to a large majority of the Union would mean disaster.

To start on a crusade without sufficient information, and without actuarial calculations as to the number likely to come upon the fund and the cost, would be an act of supreme folly. As Mr. Macnamara pointed out in his speech on the question, this new departure means a step forward in trades unionism. Are our members prepared for this? They may reach that point in time, but I do not believe they are there yet. Moreover, when you talk of increasing the subscription to provide for sustentation, you must show the average member what benefit he is likely to receive. Again, our lady members—many of them—say the annual subscription is sufficiently high now. Are they at all likely to view with favour any increase in the amount to be paid? We have also to remember that ladies, as a rule, do not like too much of the trades unionism element imported into our Union proceedings.

With all this before us, it would be a suicidal policy to take a leap in the dark. The Special Committee appointed to consider the whole question of superannuation, brought up, at the last meeting of the Executive, a carefully prepared report, which indicated the steps that should be taken, and pointed out the danger of 'legislation in a hurry.' With that report I entirely agree.

Conference and Sustentation. Several attempts were made to induce the Executive to take what is termed 'a forward step,' but without success. Forward steps are all very well when the ground is safe, but this is too serious a matter for experiments of a very risky character. I shall be told: 'Oh, Conference will be sufficiently go-ahead to increase the subscription.' Quite so! In the enthusiasm of the moment, led away by an earnest desire to secure reform, Conference *may* throw caution to the winds, and make the bold experiment. Conference has done such things before, but it has not always spoken the mind of the Associations. Take the Penrhyn grant, for example.

But even supposing the step be taken, what increase in the subscription will be considered necessary? A shilling? Two shillings? Three shillings? To do the work properly, such amounts would be ludicrously insufficient. Mr. Macnamara presented figures to the Executive showing that the total

cost would be somewhere near *half a million!* Of course the figures were received with roars of laughter. 'Let's make it a round million,' laughingly suggested one wag. But, depend upon it, if sustentation is to be a real thing, Mr. Macnamara's arithmetical calculations are not to be lightly despised.

Clearly the right policy is to *hasten slowly*, bring up a well conceived scheme, calculate the cost, and then ask the members for the money.

Infant School Teachers' Conference. The Conference Agenda has been approved by the Executive, and all the arrangements are now practically completed. The resolutions have been most carefully drafted, and one looks in vain for omissions of any importance. The general public will say, 'Well, but surely that condition of things obtains already in our Infant Schools?' But the general public is in this respect wrong. Would it be believed that even the *babies are examined?* One Inspector—who evidently has no tender mite of his own—*regrets that the mental arithmetic of the babies is weak!*

For my own part I am glad he found it so. Babies and mental arithmetic, forsooth! Let them have games and recreative occupations for the development of the intelligence and the cultivation of the faculties. This the Executive very wisely suggests. Other suggestions are (1) that inspection should be mainly directed to the sufficiency and efficiency of the staff, the methods of teaching adopted, the condition of the school buildings, and the adequacy of the apparatus employed; (2) the abolition of the individual examination of infants, and of detailed reports upon the way in which various classes, including the babies, have accomplished a fixed amount of work in various subjects of instruction; (3) that no teacher should be held responsible for the education of more than forty children, and that this number should be materially reduced in schools of special difficulty; (4) that not more than four and a half hours daily should be demanded from the little ones; (5) that the teacher of an infants' class should invariably be competent to instruct any standard in the school for older scholars, in order that the head teacher may be free to spend part of his or her time with the infants without imperilling the success of the higher standards; and (6) that the teacher's diploma should be so comprehensive as to make all supplementary certificates unnecessary.

The Rev. T. W. Sharpe, C.B., and the Cheltenham Conference. My readers will be glad to note that Mr. Sharpe has accepted the invitation of the Executive to attend the Cheltenham Conference during Easter week, to receive at the hands of the President an illuminated address in acknowledgment of the services he has rendered the cause of primary school education. 'In a position of greater freedom, and less responsibility,' he will, it is hoped, make an important pronouncement upon educational affairs. In any case, his presence upon the N.U.T. platform will be of great service to us, and I am confident his reception will be something he will remember as long as he lives.

Payment of Conference Representatives' Railway Fare. The members of the Executive, in spite of the fact that the balance-sheet is not a particularly satisfactory document—though I do not say it is unsatisfactory—have committed themselves to the policy of paying the Conference Representatives' railway fare. Whether Conference itself will agree so readily remains to be seen. I am in favour of defraying the travelling expenses of *all* who attend; but if that is impossible—and there can be no doubt at all upon this point—then the rural Associations should be selected for this special treatment. There will be a lively debate at Cheltenham on this question, and I can quite see it will be difficult to come to a decision without many divisions.

Here is a fine field for the Obstructionist; but, luckily, the President will be master of the situation. Still, I shall be surprised if the 'rurals' snatch a victory, though I believe it would be a good thing for the Union if some such provision as that contemplated by Mr. Croft and Mr. Gale, in their resolution moved on the 5th Feb., were included in the rules. The only difficulty I have in my mind is, Where shall we draw the line?

II.—EDUCATIONAL NOTES.

BY CATHERINE I. DODD,
Mistress of Method, Owens Day Training College, Manchester.

CHILD STUDY.—UNIVERSITY FOR THE MIDLANDS.—JOSEPH ARCH, WORDSWORTH, MARK TWAIN, AND PROFESSOR KIRKPATRICK ON EDUCATION.

Child study is becoming a familiar term to us now. We have a British Child Study Association, with branches in various parts of the kingdom. This society tries to interest parents and teachers to observe children systematically, and to preserve their records. 'But did not Froebel study children, and is not the Kindergarten method the result of his study?' asked an infant teacher the other day. Froebel did study children; he found out what interested them, and that helped him to work out his gifts and occupations, but there is no reason why child study should cease with Froebel.

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The study of children is still in its infancy. Dr. G. Stanley Hall was the pioneer of the movement in America, and now there are many psychologists and teachers at work endeavouring to get data which will help us to understand the child. Systematic attempts are being made to discover the contents of children's minds, to compute their vocabulary, to obtain accurate information concerning their rate of growth, their sense perceptions, to find out the best means of dealing with abnormal and defective children, and similar investigations.

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The Germans make a point of studying the individuality of each child and of watching its development. A German mother told me once that she never properly understood her own daughter until the Director of the school showed her a careful record of the child for eight years—from her eighth to her sixteenth year. Dr. Waetzoldt, of Berlin, says:—

> 'What we now call history of education is not a history of facts, but of systems and theories';

and he shows that careful collections of apparently insignificant facts of child life from the note-books of teachers and parents would be valuable material for future historians of education.

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On January 11 Miss Louch, of Cheltenham, addressed the London Branch of the Child Study Association on the subject of children's 'Interests.' She said that—

> 'Scientific observation is the work of the few, but ordinary unscientific people may by sympathetic empirical observation do work which will be useful to themselves and the children they have to deal with, which may be suggestive to scientists.'

She showed the value of considering the interests of children. It helped the teacher or parent to fix good habits, and encourage healthy tastes in the child.

She discussed children's drawings, collections, games, toys, literature, their feeling for Nature, their change of interests during adolescence, etc., showing what kind of observation is wanted in each case, suggesting methods of ascertaining such knowledge, and the practical use it might be to education if gained. She concluded by pointing out that though this knowledge could not be considered science, yet it is as necessary to a complete knowledge of the child as the knowledge which is gained by means of an 'algometer' or 'plethismo.'

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The President of the London Branch of the society, Mr. H. Holman, H.M.I., lectures on Elementary Psychology at Dr. Williams' Library, Gordon Square, every Friday evening at 8 p.m.

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On January 25 the Manchester Branch of the Child Study met, and Miss Herford and myself compared the results of certain experiments made on classes of boys and girls.

Certain exercises which tested memory of colour arrangement and form, and observation of objects, were given to an equal number of boys and girls in an excellent secondary school, and in an equally good board school. The results showed that perception by colour was keener in the former children. The board school children described the familiar objects of the streets in great detail, but their descriptions of ordinary flowers were often false and scanty. The secondary

school children had studied Botany, and were familiar with the flowers. Their descriptions were full, and showed considerable knowledge. The comparison of the results was sufficiently interesting to prove the value of the experiments.

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The question of a teaching university for London is again arising, and proposals are in the air to raise the Mason College, Birmingham, to the dignity of a university.

Mr. Chamberlain, M.P., in a speech in January, pointed out how Mason College had increased since its establishment in 1880. It has now 601 day students, and 359 evening students, and the staff consists of 27 professors, 29 demonstrators, and five mistresses. He said that—

> 'The district around Birmingham is the only great centre in England which is not already provided with university facilities. Manchester, Liverpool, and Leeds have the Victoria University; Newcastle is closely connected with Durham; Wales has its own university; and London has a university of a kind.'

He further pointed out that—

> 'Germany, with 46 millions of people, has 21 universities; Scotland, with four millions of people, has four universities; while in England, with nearly 30 millions of people, we have still only six universities.'

Our means for higher education are still imperfect, but apart from the Universities, there are university colleges, as in Bristol, Sheffield, and Reading. These are valuable aids to Higher Education.

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Three books, widely different in character, which I have found time to read this month, have each some interesting views on education :—

'The Autobiography of Joseph Arch.'
'The Early Life of Wordsworth.' Emile Legouis.
'More Tramps Abroad.' Mark Twain.

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We are proud of our present educational advantages, and we believe that we must accomplish great things, but the school is only one influence at work in forming character. Joseph Arch's life shows us how much he owes to home influence and Nature. His mother was an excellent woman, sturdy and independent, but not without prejudices. She brought up her little son on the Bible and Shakespeare, and she succeeded in inspiring in him an interest in books which our school education fails to excite in children of the present day. Joseph Arch says of his mother :—

> 'She was a great admirer of Shakespeare. She used to talk about him very often, and she was well versed in his works. She would read bits aloud to me of an evening, and tell me tales of his plays. On Sundays she used to read the Bible to me in the same way, and tell me stories from it. Shakespeare and the Bible were the books I was brought up on, and I don't want any better.'

Joseph Arch received all the schooling he ever had at a village school between the ages of six and nine years, but he learned to read, and that opened up to him vistas of knowledge. He was sent to work in the fields at nine years of age, and in after years he thanks Heaven that he lived in the country, and not in a mining district :—

> 'I had sky over my head, and if there came wind and rain and stormy weather, there came sunshine too. And I had trees to look at and climb, hedgerow flowers to pluck, and streams to wade in. Nature's feast of changing beauty was always spread out before me; and though I did not think much about it in that way, still I was taking it all in without knowing it.'

A good mother, Shakespeare and the Bible, and constant communion with Nature, these are the elements of a liberal education.

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Wordsworth's 'Prelude' is full of educational wisdom, and M. Legouis is not slow to recognise this. He contrasts the schooldays of various French poets with those of Wordsworth, and shows how in the former case they produced a feeling of gloom, irritation, and restraint, while Wordsworth's schooldays in the little North of England grammar school were free, joyous, unrestrained, and fruitful.

The boy Wordsworth rambled freely among the woods and fields; he was free to make acquaintances, and the same freedom was permitted him in the choice of books. He rejoices that he was nourished on fairy tales in his childhood :—

> 'Oh! give us once again the wishing cap
> Of Fortunatus, and the invisible coat
> Of Jack the Giant-Killer, Robin Hood,
> And Sabra in the forest with St. George!
> The child, whose love is here, at least, doth reap
> One precious gain, that he forgets himself.'

Again he speaks of the influence of Greek tales, Bible stories, and Shakespeare. He rejoices also in his early intercourse with Nature :—

> 'He who in his youth
> A daily wanderer among woods and fields
> With living Nature hath been intimate,
> Not only in that raw unpractised time,
> Is stirred to ecstacy . . .
> 'But further doth receive
> In measure only dealt out to himself,
> Knowledge and increase of enduring joy
> From the great Nature, that exists in works
> Of mighty poets.'

M. Emile Legouis has written a fascinating study of Wordsworth's youth from the poet's autobiographical poem, 'The Prelude.' He says :—

> '"The Prelude" is less a narrative than a study of origins, less the history of a man than the philosophy of a mind.'

Books and Nature were the influences which made Wordsworth the man and the poet :—

> 'Where had we been, we two, beloved friend!'

He says to Coleridge—

> 'If in the sealon of unperilous choice
> —— We had been followed, hourly watched.'

He read everything; often, he says, he lay the whole day long by the Derwent—

> 'And there have read, devouring as I read.'

Nature thrusts herself upon him :

> . . . . 'the earth
> And common face of nature spake to me
> Rememberable things.'

Games, too, absorb him :

> 'I to the sport betook myself again,'

and, tired out with sport, he reaches the dame's cottage—

> 'Feverish with weary joints and beating mind.'

'The Prelude' is a poem for all teachers and parents to ponder over.

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We do not include Wordsworth among our educational writers when we draw up courses for young students of education, but I can fancy the joy of the intelligent student in having such a theme as this to discuss: Compare the educational principles in Wordsworth's 'Prelude' with those laid down in Rousseau's 'Emile' or in Spencer's 'Education.'

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Child Study Notes.—Dr. Shuttleworth addressed the London Branch of the British Child Study Association in February on the subject of Exceptional Children. The lecturer stated that he used the word *exceptional* as opposed to *average*, and by the term he included children above, as well as below the line of normal intelligence. Above were the exceptionally quick, precocious, gifted children; below were the mentally and morally deficient. In both these cases the children needed exceptional educational treatment. The lecturer urged that just as giants and dwarfs may be sometimes traced to a common or connected origin, so cases of exceptional children might be considered as varying forms of mental abnormality. Nature inclines towards an average in intellectual endowment as well as in other matters; this is sometimes seen in families, of which some members are geniuses and others fools. The pedigree of deficient children occasionally shows the existence of unusual talent amongst near relatives, especially in the artistic and musical directions. Precocious children were often the progeny of neurotic parents, and consequently liable to break down under strain. The cultivation of prematurely developed talent to the exclusion of all-round training was a mistake, though so-called 'juvenile prodigies' were often manufactured in this way. The after career of these prodigies was seldom satisfactory, for, as Herbert Spencer says,

> 'The abnormally rapid growth of any organ in respect of structure involves premature arrest of its growth.'

III.—LONDON SCHOOL BOARD NOTES AND TECHNICAL AND SECONDARY EDUCATION.

As stated in our February issue, it is proposed in these columns to keep our readers acquainted with the salient points of the work of the London School Board, and to summarize the events which happen in connection with the movement for the organization of Technical and Secondary Education. The importance of the work of the London School Board cannot be over-estimated. Its developments are watched with intense interest, and the result of the deliberations is often anticipated with considerable anxiety.

POLICY OF THE MAJORITY.

The result of the recent election was a return to the Board of a majority of persons whose principal concern was stated to be the supply of sufficient and efficient accommodation, the fair treatment of employes, the avoidance of religious friction, the freeing of Evening Schools, a progressive labour policy, and the provision of higher educational facilities for the children of the people.

THE MINORITY.

The minority consists of those who are opposed to the expenditure of any more money than can possibly be helped on the education of the people; who will not supply accommodation in places where it is needed for fear of depleting the voluntary schools; who desire to denominationalize, as far as possible, the religious teaching in the Board schools, and generally to further the interests of the Voluntary schools rather than those of schools belonging to the Board.

CONSTITUTION OF THE BOARD.

The Board consists of fifty-five members, representing the eleven districts into which, for School Board purposes, the metropolis is divided. Among those returned are eight women, and four ex-teachers of elementary schools, two of whom, Messrs. Bowden and Macnamara, are also ex-presidents of the National Union of Teachers. It will thus be seen that there is a leaven of practical teachers to mitigate the severity of any doctrinaire resolution which may be proposed.

HOW THE WORK IS DONE.

The Board meets weekly on Thursday afternoon. The Chairman is Lord Reay, G.C.S.I., G.C.I.E., chosen unanimously from outside the ranks of the elected members, and the Hon. Lyulph Stanley is the Vice-chairman. Six Standing Committees deal with the questions of School Accommodation and Attendance, Works, School Management, Finance, Industrial Schools and General Purposes, but so multifarious are the duties and responsibilities, that each of these is again divided into a large number of sub-committees, and a member might very easily give up the whole of his time to the duties of the committees and then find his days and weeks too short to fulfil all the requirements of the work to his own satisfaction.

DIVISIONAL COMMITTEES AND MANAGERS.

In addition to the above the divisional members meet once a month, forming, as it were, eleven petty school boards for their various constituencies, dealing with a multiplicity of subjects locally of importance, but not necessary to come under the purview of the whole of the Board. The schools of the Board, which are ever increasing in number, are placed under local managers nominated by the divisional members. Every district has a divisional superintendent and an official correspondent. Under the former work the vast army of attendance officers and visitors whose duty it is to enforce the bye laws and carry out the provisions of the Education Acts. Every year a general and simultaneous scheduling of the children of school age takes place, and largely upon this are based the calculations of the committee responsible for providing accommodation.

SCHOOLS AND CHILDREN.

Nearly eight hundred thousand (800,000) children have to be provided for, and of these the London School Board is responsible for the provision for over half a million in some five hundred schools, under an army of over eleven thousand teachers. To this number every year makes a considerable addition. The schools, however, are large, the number of certificated assistants so numerous, and the vacancies in the headships so few, that promotion for the teacher is extremely slow. Schools are graded according to their size, and salaries follow the same plan. Every school is provided with an adult staff in excess of the requirements of the Code, and in many cases by the addition of pupil teachers and ex-pupil teachers often reaches 50 per cent. above the minimum allowed by the Code.

THE WORK BEFORE THE BOARD.

First and foremost is the supply of needed schools. There seems no disposition to dally with the work. In the School Accommodation and Attendance Committee the policy of delay will no longer be tolerated. As an example of delay, a case in point came before the Committee on the 17th February. In Streatham powers had been obtained to secure a site and build a school in Feb. 1895. Yet, owing to a misconceived idea on the part of some members of the Board that it has only to step in when voluntary managers do not fill up the deficiency, nothing has yet been done. The Board decided by a large majority no longer to neglect its obvious duty, and will at once begin to build a school.

At its earliest meetings it brushed aside the religious wrangles and possibilities of wrangles, although a stray echo of them is still heard in committees and in the Board itself. A motion with respect to improving the attendance was relegated to a committee, where it is receiving earnest attention. The same may be said with respect to an increase in the assistant teacher's maximum salary, and the provision of further education in higher grade schools. The thorny question of superannuation—the rock which parts asunder heads and assistants—seems likely to give as much trouble, provoke as long discussion, and be productive of as great delay as the national scheme. More than one member has tried his 'prentice hand on the subject, and thinks he has solved the problem. But each scheme has to run the gauntlet of actuarial investigation, and as yet no solution seems probable.

Meanwhile, the demand for the return of compulsory premiums from those who have entered the service during the last few years is being persistently made by the assistant's champion, Mr. Gautrey.

INSPECTION.

Some members of the Board imagine that the way to secure efficiency is to supply the schools with an army of inspectors, superintendents, special instructors, demonstrators and the like. Already there are in the employ of the Board eighty of such persons in one capacity or another. Yet there is an evident desire on the part of some members to add to the number. Now, the Board pays on the whole good salaries, it employs the best teachers it can procure, and in the opinion of many ought to trust the teachers when once elected. Consequently, when the application from the School Management Committee for a third examiner in needlework came before the Board, it was stoutly resisted and defeated. There may be some relief from any further attempts to increase the inspectorial staff for some time to come.

FREE EVENING SCHOOLS, &c.

On the 18th February the Board resolved to free its evening schools, notwithstanding opposition on the part of some of the Moderate party; it decided that higher standard schools should be built with class-rooms for 40 scholars only; it passed resolutions defining its requirements respecting Kindergarten certificates; and it decided to hold a special meeting on Thursday next to fill up the vacancy caused by the lamented death of General Moberly, the late Vice-chairman of the Board.

EDUCATION IN SCOTLAND.

E.I.S. NOTES, &c.

BY JAS. PATERSON,
Vice-President of the Educational Institute of Scotland.

The Institute's reply to Sir H. Craik. The *Glasgow Evening News* in an article on the reply of the Educational Institute of Scotland to Sir H. Craik's letter regarding the dismissal cases submitted to the Department has the following:—'The Institute's analysis of the reply is not only logically crushing, but reduces a policy of *laissez faire* to an official confession of ineptitude. Securing the teacher a reasonable fixity of tenure has no earthly connection with a curtailment of the people's right to manage their own affairs. The people elect Parliaments as well as School Boards. Parliament created the Board, and Parliament can restrict the Board's powers. There is neither logic nor manliness in submitting to a removable evil. The School Board partially paralyses the teacher, it defrauds the people of their full measure of education, it humiliates and terrorises the sensitive and finely-organised members of a noble profession. That is the teacher's case. He only asks permission to do his duty, to throw his whole self and heart and energy into his work. He cannot do either without peace, without protection against harassing anxiety for his livelihood and his future, and against senseless attacks upon his self-respect. Whether a wronged teacher shall have a right of appeal is a question being answered more and more widely in the affirmative. A change is believed to be necessary in the direction of curbing the School Board in the capricious and oppressive exercise of its power. It is also believed that a change will come which may not place the lady teacher beside Patti in the matter of emolument, but equal to Patti in respect and dignity, and above Patti in security of tenure.'

Secondary Teachers' Association. Mr. William Thomson, B.A. (Lond.), Headmaster of Hutcheson's Girls' School, Glasgow, in retiring from the office of President of the Association of Teachers in the Secondary Schools of Scotland, delivered an exceedingly able and thoughtful address. In speaking of the principle that education ranks among the greatest interests of a nation, Mr. Thomson ventured to suggest to those in authority in their treatment of the teachers of the country that they should encourage them to rise to a more independent position; develop their self-respect by showing confidence in them; draw out their powers by securing for them a larger measure of freedom and responsibility; show the honesty of their convictions about education by sending their sons to swell the ranks of the profession; and continue all this till the profession abounds in men whom they delight, not to keep in their places, but to honour.

Aberdeen Branch E.I.S. At the January Meeting of the Aberdeen branch of the E.I.S. Miss Mary Reith, St. Paul Street School, read a paper on 'The place of Fiction in education.' Miss Reith held that literature was the prime factor in education. She discussed the educative value of the novel in the first place as an aid to style. She then proceeded to note that the child's imagination must be fed, and they looked to fiction to supply what was wanted. The novel increased the knowledge of foreign lands, and gave interest to the Geography lesson. The study of History was made a delight through this medium, and science and natural history were both indebted to fiction for the interest their pages awakened in the boy. If they had in connection with each school a well-stocked and carefully-selected library, and if the scholars were encouraged to read, the children would leave school with a habit of reading formed which would be the chief factor for self-development.

Presentation of Adresses to H.M.I's. At the above meeting of the Aberdeen branch it was unanimously resolved to present Mr. Whyte, H.M.I., and Mr. Craigie, H.M.S.-I., who have just left the Aberdeen district, with addresses expressive of the members' deep sense of the eminent services rendered to education in the district by these gentlemen, the keen sense of loss felt by their removal, and the best wishes of the teachers of Aberdeenshire for their happiness and success in their new spheres of labour.

Geography in Education. Mr. H. R. Mill, D.Sc., librarian of the Royal Geographical Society, lately delivered a lecture to the Aberdeen branch of the Secondary Teachers' Association on the subject of 'Geography in Education.' Dr. Mill said there was hardly a country where Geography received less attention than in our own. In all of the twenty-seven or twenty-eight universities of Germany, with the exception of two, there is a Professor of Geography, while in not a single university in this country is there such a functionary. What was being taught in the name of Geography was not geography at all. There was an idea that the subject was to be learned out of text-books and maps, and, while not condemning these aids, he said that to teach Geography solely from these sources was to teach it in an altogether wrong way. Geography dealt with real things, real places, and real people. If in schools attention were concentrated upon a few of the leading facts that would form a nucleus around which other facts could be attracted, then elementary instruction in Geography would be carried on upon practical lines. By means of lime-light illustrations the lecturer proceeded to deal with his subject in detail, and he concluded an interesting and instructive lecture by exhibiting a number of fine slides of the North and vicinity.

The Method of Teaching History. At the February meeting of the Edinburgh branch of the E.I.S., Professor Prothero, Edinburgh University, gave a lecture on 'The Method of Teaching History.' In the course of his lecture the professor remarked that with the multiplicity of subjects the teaching of History was liable to be squeezed out of the school curriculum. The subject was recognised on the Continent, and in Germany particularly, far more than in this country. Teachers of History, he went on to say, were inclined to begin at the wrong end—beginning with generalisations when they ought to begin with particulars. It was the nature of the young mind not to generalise, but to observe. Having stirred their imaginations, let them get the idea of distance and perspective. After that they would get sequence and connection, from which they could teach contemporary events, and, gradually, general deductions. Concluding, Professor Prothero said that what teachers should aim at was to teach the student to know, secondly to think and reason about everything he knew, and lastly to feel. On the motion of Dr. Paterson, Moray House, a hearty vote of thanks was awarded to Professor Prothero.

THE TERRIBLE INSPECTOR.

(*The school having recovered from its Annual Spring Cleaning.*)

Spring-time brings the east wind and the east wind brings the *haar*,
Then coughs and colds, bronchitis, influenza, and catarrh,
But not a sign is surer in the total zod-i-ac
Than our rummy old inspector with his clack, clack, clack—
Clack, clack, clack, the bairnies' brains we pack,
Or stimulate their intellects with whack, whack, whack.

The children in the playground look to east, and west, and south,
With a quiver in their eyelids and a pucker in their mouth,
Till from some new direction, as their brains are on the rack,
Drives up the old inspector on an unexpected track:
Then Tom, and Jill, and Jack re-enter in a crack,
Like rabbits to their burrows flying back, back, back.

The children move their fingers in the 'brisk, quick way,'
Or else they could not do their sums if they should try all day;
The inspector spots them at—he at watching has the knack—
And he's down on them like thunder in a crack, crack, crack.
Crack, crack, crack, much inclined to smack
Is the terrible inspector looking black, black, black.

Geography and history he tests, and grammar too,
Good points and bad distinguishing with pencils red and blue;
He frowns across the registers, and then prepares to pack
The papers and the parchments in his old official sack—
Sack! sack! sack! teachers get the sack
Who fail in earning properly the Governmental plack.

The children 'skaill,' and out of doors make all the noise they durst;
The Inspector hath a human side of hunger and of thirst,
The minister, whose name begins most properly with Mac,
Convoys him to the manse to have a comfortable snack—
Snack! snack! snack! the knitted brow doth slack!
He's not so bad with toddy at a crack, crack, crack.

[By Mr. R. J. MUIR, H.M.I., from the *Educational News.*

EDUCATION ABROAD.

BY E. E. FOURNIER D'ALBE, B.SC., A.R.C.S.

THE Madras *Educational Review* contains a leader emphatically condemning the tendency of the *Times* article advocating the abolition of the teaching of Indian history in aided schools and colleges for political reasons. The consequence of the idea of a former united and prosperous India gaining wide acceptance, is widespread unrest under the present system, according to the *Times* article. The Indian review mentioned supposes the writer of the article to be Sir William Hunter, himself an Indian historian, who is altogether opposed to the conception of a past greatness and a past unity of the Hindoos :—

> 'We should have thought,' it says, 'that Sir William Hunter would have been the first to acknowledge that this conception of a past greatness is essentially correct, whatever may be said of the implied notion that the Hindoos ever formed a single nation. There is not a particle of historical evidence to support this latter idea ; but there is abundant evidence to prove that the Hindoos have a past which may be truly called great, and to which they may look back with pardonable pride.'

The panic caused by the Poona outrage should not be made an excuse for gagging historical instruction.

* * * * * *

BOTANICAL Enterprise in West Africa.—Mr. F. E. Willey, of the Botanical Station at Sierra Leone, together with the Curator of the Gambia Botanic Station, has spent eight weeks at Kew, in accordance with an arrangement made with the Colonial Office. They have been studying African plants and products in the houses and museums of the Royal gardens, and getting information in the City and elsewhere about the commercial value and method of treating subjects likely to be remunerative in West Africa. The earliest West African Station was started at Lagos by Sir Alfred Maloney in 1888, the next at Aburi, on the Gold Coast, in 1894, whilst the station on the Gambia was established in 1894, and a station at Freetown, Sierra Leone, in 1895. A station was also established in 1891 under the Foreign Office in the Niger Coast Protectorate.

* * * * * *

THE language puzzle in Bohemia continues to strain the ingenuity of the administration. The latest announcement is that German and Czech are to be compulsory subjects in all Bohemian and Moravian schools. The German-speaking teachers naturally object to this, alleging that nobody understands Czech outside a limited district. This argument is, of course, not altogether to the point, since in some cases the study of even a dead language is desirable. But the secret of the strenuous opposition of the German element is that the Slav is likely to have it all his own way before very long.

* * * * * *

THE Czech language question is as old as the Reformation. Johannes Huss translated the Latin liturgy into Czech, and preached in that language. He did for his Bohemians what Luther did for Germany. Luther established the Saxo-Thuringian dialect as the recognised written language of Germany. Huss saved the Czech language from annihilation. When the cause of a language thus becomes linked with religious fervour, it is well-nigh invincible. In addition, we have the modern resources of the press, which guard against any spoken language dying out once it is widely read. Circumstances are thus in favour of Czech, but the conflict is deplorable.

* * * * * *

THE German language is threatened in several other quarters. In New York, according to the new regulations, German is not to be taught in the public elementary schools. At the same time the Russian Education Office has drawn up a set of rules for the national schools, which are about to be established to the number of 30,000 in European Russia. One of the rules makes attendance compulsory. It is to be hoped that this rule will not be a dead letter, as it is in Italy, and to a large extent in France also. Another rule makes Russian the sole medium of instruction. This will be a serious blow to the German schools in Central and Southern Russia.

IN opposition to the prevailing belief that the Red Indian is dying out, it has often been alleged that there are at the present moment more American Indians living than at any previous time, the only difference being that the whites outnumber them more overwhelmingly than formerly. Some of the Indian girls are now achieving high distinction, even in science. Miss L. Singh, of pure Indian descent, has recently graduated as an M.D. with great distinction. Miss Phœbe Wood, daughter of a Pawnee chief, is going through a course of training in New York as a sick nurse.

* * * * * *

THE question of federal subvention of education in Switzerland is making considerable progress. The cantons of Zürich, Bern, Aargau, St. Gallen, Graubünden, Thurgau, Schaffhausen, Tessin, Bâle, Neuenburg, and Solothurn have already acquiesced in the proposal. The town of Bâle has concurred under the proviso that the subvention of high schools is to be settled at the same time. This may cause some delay. Federal subvention may appear to the uninitiated like the process of taking money out of one pocket and putting it in the other. But the Federal Council has wider taxing powers, and the Swiss educational system will be the better for a little more uniformity.

* * * * * *

THE *North China Herald* describes in gloomy colours the overcrowding of the Chinese Civil Service, and the sufferings of the too numerous candidates for employment. The civil service examinations are probably the most severe in the world. Last year no less than 20,000 came to Nankin alone for the annual Government examination. There is no superior age limit, and candidates can enter again and again. During the examination, which lasts several days, the candidates and examiners are locked up in sealed rooms. The hardships and privations undergone are terrible. This rush for Government employment, far from being encouraging, is a sure sign of decadence. A healthy individualism is the only remedy.

* * * * * *

THE socialism which is widespread among teachers in the Netherlands, has given rise to many attacks in the Dutch Parliament by members of the clerical party. The three chief teachers' associations of the country have warded off these attacks by the following resolution :—

> 'Whereas it is against any reasonable view of educational duties to suppose that the teacher should disseminate political or economic doctrines amongst his pupils, this meeting protests against Herr de Savornin-Lohmann's insinuations, and expresses its conviction that the socio-political inclination of the teacher does not affect his value as a pedagogue.'

* * * * * *

THE *Journal des Instituteurs* contains a charming account of Durécu, the French life-saving hero. The career of this remarkable man was a long series of rescues from drowning, interspersed with desertions from the navy. As a mere boy, he saved two others from drowning in the Mare aux Huguenots, near Havre. In 1824, being twelve years of age, he saved two artillery men from the basin of the Citadel. When at his post off Monte Video, on board the French corvette *Lerida*, watching a pirate vessel, the idea occurred to him to capture the privateer single-handed. He swam across to her—a swim of nearly two hours—gagged the sentinel, battened down the hatchways, and steered for the *Lerida*. The operation was successful, but the sailor was court-martialled for leaving his post. Later on he quarrelled with the *maître d'armes*, pretended to fall into the water by accident, and deserted. While his family were having masses said for his soul, he was navigating the seas on board a Norwegian. Seized with home-sickness, he returned to France, got wrecked off La Hève, landed a cable, saved 18 persons, and was eventually himself carried ashore in a fainting condition. He was again court-martialled for desertion, and had to put in long years of service before an indulgent Government decorated him with the well-earned red ribbon. He saved over 200 lives, eventually dying from the consequences of his last rescue. His bust adorns the Maison des Sauveteurs at Havre.

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LESSON ON TEA.

BY PROFESSOR J. R. GREEN, SC.D., F.R.S.

Examiner in Botany to the University of London;
Late Examiner in Botany in the University of Cambridge.

SEE SUPPLEMENT PRESENTED WITH THIS NUMBER.

I. DESCRIPTION OF THE TEA PLANT, *Camellia Thea.* (*C. theifera*, Griff.).

(i.) *The Assam Variety* (Fig. 3).—In its natural state it is a forest tree, usually about thirty feet high, with a single stem, light, ash-coloured bark, and large yellowish-green leaves. Under cultivation it is dwarfed into a shrub capable of being plucked without the aid of ladders. Then a fully-developed leaf is nearly a foot in length, the stem is about eight inches in diameter, the circumference of the plant round the tips of the branches twenty feet, and the height four to five feet.

(ii.) *The China Plant* (Fig. 1).—It is an evergreen shrub with wiry stems and numerous small dark, glossy leaves, seldom longer than two inches.

(iii.) *The Hybrid Tea Plant* is generally cultivated in India, and has the hardiness of the China plant with the productiveness of the Assam variety.

(iv.) *Botanical Features of the Tea Plant* (*Tree or Shrub*).—The leaves taper towards base and apex, have a *serrate* or sawlike margin, and the young leaves only have on their under surface numerous hairs. If the leaf be slightly pressed between two cover glasses and heated with alkaline permanganate, afterwards treating with HCl to remove manganese oxide, their structure may be made out. The stomata are very numerous, and the long-branched cells called *idioplasts* should be noticed. The flowers are white, solitary, and pendulous; the calyx is persistent and five-leaved; the corolla has from six to nine petals, all of which are united to one another at the base; the stamens are numerous, arranged in several whorls and adhering to the base of the petals. The ovary, which is free from the calyx, is three-celled. The fruit (Fig. 2) is three-lobed, and opens along the middle of the lobes. The seeds are solitary, or rarely two in cells.

II. LEGENDARY ORIGIN OF THE TEA PLANT.

(i.) In the *She King*, compiled by Confucius: During the dynasty of Tsin, in the reign of Yoen Ty, an old woman used every morning to go to the market at daybreak, carrying a small cup of tea on the palm of her hand. Although the people sought it eagerly all day, the cup was never exhausted. The money she received she gave to orphans and beggars on the highway. When the people, suspecting magic, seized her and confined her in prison, she flew through the prison window with her little vase in her hand.

(ii.) Another Chinese narrative: About 510 an Indian prince and fakir named Dharma vowed that he would do without sleep. For some years he did so, but was one day overtaken by sleep on a mountain side. Grieved at this infraction of his vow, he pulled out his eye-lashes and threw them on the ground. When he passed that way next he found that the eye-lashes had grown into bushes. He nibbled the leaves, found that they helped him to keep awake, and told his neighbours of his discovery. Thus the tea plant came into cultivation.

III. THE EARLY HISTORY OF TEA.

(i.) *China.*—Tea seems to have been made in China, notwithstanding the story of Dharma, in the 4th century (Dr. Bretschneider), and in 793 A.D. it was subjected to an imperial duty.

(ii.) *Japan.*—Japanese writers state that they obtained tea from China in the 9th century. The Japanese began to cultivate the plant in 1206.

(iii.) *Europe.*—The Portuguese claim to have introduced tea into Europe early in the 14th century. The Dutch claim that they were first to show tea in Europe, some having been exhibited in Amsterdam and thence sent to London. In June 1664 the East Indian Company presented Charles II. with some which cost forty shillings a pound. Pepys (Diary) first drunk 'tea, a China drink,' 28th September 1660, and a duty was imposed on its exportation, together with chocolate and sherbet, in the same year. In 1678 the East Indian Company imported 4,713 lb. of tea.

(iv.) *India.*—Major Bruce discovered the Assam wild tea plant about 1821. Mr. David Scott, first commissioner of Assam, seems to have been the first to consider the question of its cultivation. The China tea plant was first cultivated in India by Colonel Kyd (1780), who procured the seed from China. Mr. C. Bruce, brother of Major Bruce, was the first Indian tea planter, 1835 (Chinese plants), while indigenous tea was first planted by Col. Jenkins and Dr. White. Tea planting was started in Kumaon 1850, Darjeeling 1860, Neilgherries 1864, Ceylon 1873.

(v.) *Jamaica.*—The first plants of tea grown in Jamaica were supplied from Kew in 1869. Indian teas are being grown there, and there is a probability that the tea industry may be successfully established there.

(vi.) *Madagascar.*—The first attempt to cultivate the tea plant was made in 1887.

(vii.) *Natal.*—The first tea plants were sent from Kew in 1850. In 1880 the first real tea field was planted. There were thirty-seven tea exhibits in the Natal Court at the Colonial and Indian Exhibition.

(viii.) *Caucasus.*—43,000 acres of Government land were purchased by the Department of Crown Estates for tea estates in 1894. In 1895 the Russian Government ordered a commission to proceed to India, China, and Ceylon to thoroughly study the methods of tea culture in those countries.

(ix.) *Java.*—Tea has for many years been an important industry in Java.

IV. THE CULTIVATION OF THE TEA PLANT.

(i.) *Soil.*—Forest land is best, with an aspect between north-west and south-east. Jungle, or scrub, and grass land can be brought under cultivation. The plant requires moisture, and too great an exposure to sun and drying winds is bad. The soil should be rich, loose, and friable, and on a slope.

(ii.) *Planting.*—(*a*) Sowing at stake, *i.e.*, where the plants are to grow. The fruit plucked about the end of November splits, and women or children take out the seeds. They are then put into covered baskets and dibbled either into a nursery bed or where they are to grow. In the latter case two or three seeds are put in at each stake, so as to ensure at least one seedling. (*b*) Transplanting from a nursery, which must be near a perennial water supply, perfectly drained, with a fair and rather stiff soil, protected from drying winds and shady. When the seedlings are six to eight inches high, they are removed to the tea-fields as soon as the rains have saturated the ground.

(iii.) *Terracing.*—Slopes should be terraced, thus facilitating manuring and preventing the surface of the slope from being washed bare.

(iv.) *Cultivation.*—The ground in the case of young seedlings is weeded and hoed. In the case of established plants the land is hoed; then come the pruners; then a gang of women and children with hand forks. In the cold season the trees are manured and lightly pruned. In spring the new shoots are plucked to make them more bushy.

V. TEA BLIGHTS AND PESTS.

(i.) *Red Spider.*—The Red Spider is a mite, its head, thorax, and abdomen being all fused into one. It lays small, transparent, red eggs. The mite buries its forceps in the substance of the leaf and sucks out the cellular tissue and juices. It always appears on the upper surfaces of the leaves, and is very destructive. The best remedies are high cultivation, syringing with lime-water, and sprinkling the bushes with a mixture of one part of lime to two parts of wood ashes.

(ii.) *Green Fly, or Tea Aphis.*—It is from one-eighth to one-sixth of an inch long, and propagates with great rapidity. It punctures the young leaves and stems and the leaves fall off. The best remedy is syringing.

(iii.) *Tea Bug.*—At first it is pale green, and less than one-eighth of an inch long; it turns darker, and eventually becomes black. It makes small brown punctures in the younger leaves, which die off.

(iv.) *Orange Beetle.*—About three-eighths of an inch long, it eats away part of the green stem of shoots just fit to pluck. The shoot withers and turns black. The best remedy is to catch it with butterfly nets. A boy has been known to bag 300 of these beetles in an hour.

VI. THE MANUFACTURE OF TEA.

(i.) *Ball Tea* (Fig. 6). (α).—In India the leaf is picked in small baskets in the day time and allowed to wither all night in a cool place. In the morning it is rolled on mats on the floor, then placed in balls in a blanket inside a basket to ferment. The balls are then broken up and panned (Fig. 8.) for a minute or two. While hot they are thrown on tables covered with China mats, and rolled on them for a minute or so. They are then dried in the sun, or over charcoal fires, on oblong mats made of bamboo strips plaited close together (Fig. 7). An Indian tea factory usually conaists of three rooms; a-rolling room, a firing room, and a packing room. Among the tables in the rolling room is a long narrow one, with a ledge nailed round, and divided into compartments, each big enough to hold one feed of rolled leaf. Even if a machine is used for rolling, a finishing hand roll is given on a rolling table. In the firing room, the firing is done either over charcoal, (the older method), or over hot air. The packing room is fitted with bins.

(β) —In China methods are more primitive. A large round iron boiler is covered by a wooden barrel, held in position by a heavy stone, so that a vigorous jet of steam issues from a single vent at the top. Nine Chinese ounces of tea are weighed out and sprinkled into a copper vessel, perforated below, which is then placed over the vent, so that the tea is fermented by steam. After about a minute the vessel is removed and the tea poured into a cotton bag (Fig. 6), the ends of which are wound round and squeezed into a lump. It is subjected to pressure and placed in a rack to cool.

(ii.) *Brick Tea* (Fig. 1).—The full-grown leaves are loosely pressed into blocks about 10 inches by 10 inches and 4 inches thick. The teapot of Thibet is a wooden churn in which the boiling infusion is poured through a strainer. A little salt is then added, and about 20 strokes given of a dasher pierced with five holes. A lump of butter is thrown in, and the compound is churned by from 100 to 150 strokes being given. It is then ready to drink.

(iii.) *Tablet Tea.*—In use throughout Russian Siberia. Manufactured at Hankow. The larger tablets are manufactured from common tea dust steamed in a pudding-cloth and poured into a wood mould. It is pressed to the necessary consistency by lever, or a heavy mallet wielded by one of the labourers. The small tablets are made of the finest tea dust poured dry into a steel mould and subjected by machinery to a pressure of two tons per tablet.

(iv.) *Green Tea.*—Green tea is much less used than black tea. It is prepared from young leaves, which are roasted over a wood fire, within an hour or two of being gathered. Amritsar is the green tea mart. Some green tea is prepared in Kangra.

VII. THE ADULTERANTS OF TEA.

Sloe, liquorice, and ash leaves, iron filings, sand, straw, rice husks and the excrement of silkworms have been found in cheap common teas. There is a trade in China in willow leaves for adulterating tea. Where facing has been resorted to, once-used leaves have been found to be made up with Prussian blue, silica, gypsum, plumbago, lampblack and ferruginous earth.

VIII. THE CONSTITUENTS OF TEA.

(i.) Essential oil, citron yellow in colour. (ii.) Theine, an alkaloid with a slightly bitter taste, which is in large doses toxic. (iii.) Boheic acid, a pale yellow powder. (iv.) Quercitrinic acid, sulphur-coloured crystals, bitter in solution. (v.) Oxalic acid, gum, chlorophyl, resin, wax, albuminous woody and colouring matters and ash.

IX. MEDICAL PROPERTIES OF TEA.

(i.) Green tea has nearly the same power as digitalis of controlling and abating the action of the heart. It disturbs the nervous system, and induces extreme wakefulness.

(ii.) Tannin is a powerful astringent.

(iii.) Theine is a sedative.

X. SUBSTITUTES FOR TEA.

(i.) *Paraguay Tea* (*Maté*).—The leaves of a species of holly are either dried or scorched and pulverized into a coarse powder which is then packed in sacks. In 1882 eight millions of lbs. were drunk in South America. Maté is the name of a small gourd which forms the drinking cup. It is infused like tea and drunk through a tube called a *bombilla*.

(ii.) *Guarana.*—The seeds in Brazil are pounded into a paste and formed into rolls, which, when dry, become hard and dark like sausages. A tablespoonful is cut from the roll and placed in half-a-pint of hot sugar and water.

(iii.) *Various species of Myrtle* are known in Australia as 'tea shrubs.'

(iv.) *Various species of Heath, and the Winterberry* have been used in Canada in place of tea ('Mountain tea, Labrador tea, Winterberry tea.')

XI. TEA STATISTICS.

China, India and Ceylon are the great tea-producing countries. Indian tea is driving out Chinese tea because of its strength, greater carefulness of manufacture, and greater freedom from adulteration. Thus, taking 100 as the unit, in 1883 the China supply was 66, Indian 33, Ceylon 1. In 1894 the China supply was 12, Indian, 55, Ceylon 33.

A SCHEME OF OBJECT LESSONS.

BY WILLIAM DONE, B.A.,
Head Master of the Pupil Teachers' School, Brighton.

CIRCULAR 369, forming Appendix IX. to the Instructions of Her Majesty's Inspectors, was probably one of the most broad-minded and truly educational documents ever issued from the Department. It ought to be embodied in any book on School Management studied by our young teachers.

A general opinion had been expressed by the Chief Inspectors some time previously that the condition of the lower part of Boys' and Girls' schools was the weakest point in elementary education. It was stated that while the instruction in Infants' schools was by natural methods, through observation and reasoning, children in the upper school were often taught by arbitrary and conventional methods. In order then to make the transition easier from the Infants' school, and to further cultivate the faculties of observation and judgment, Object Lessons were introduced into the Code for Standards I., II., III.

The Circular insists primarily that suitable appeal must be made to the eye of the scholar. 'That a lesson, for example, on the Elephant to children who have no opportunity of visiting the Zoological Gardens or Museums, does not cultivate the habit of obtaining knowledge directly and at first hand through the senses. However well the lesson may be illustrated by diagrams, pictures, models, or lantern slides, if the children have no opportunity of handling or watching the actual object which is being dealt with, the teacher will be giving an Information Lesson rather than an Object Lesson. It should always be remembered that in Object Lessons the imparting of information is secondary to the cultivation of the faculty of observation.'

The teacher is specially advised not to select more objects than can be thoroughly dealt with in the year without burdening the scholars. Habits of observation are better cultivated by the thorough examination of a few objects than by the superficial treatment of many.

Probably the best year's work and the most interesting to the children is the Scheme for Lessons on Animal Life. This series has been specially prepared in sheets by Messrs. T. Nelson & Sons in three sets, and with each set a handbook is issued containing full notes of lessons on each object.

ANIMAL LIFE.

A.

I. *The Cat* (compare with Dog).—Eyes, rough dry tongue, soft pads and sharp claws, teeth, method of holding prey, drinking, covering of fur, whiskers, tail.

II. *The Cow* (compare with Sheep and Goat).—How she takes her food, teeth, chewing, milk (cheese and butter) tail, hoofs, covering, ears, horns, nose.

III. *The Horse* (compare with Donkey).—Covering, teeth, hoofs, tail, mane.

IV. *The Rabbit* (compare with Hare).—Teeth, legs, feet, claws, covering, tail, whiskers, ears, and eyes.

V. *The Mouse* (compare with Rat and Water Rat).—Teeth, paws, tail, whiskers, eyes, ears.

VI. *A Fish.*—How fitted to live in water, weight, shape, covering, temperature, movements.

VII. *A Plaice* (compare with Herring).—Flat, eyes on one side of the head, gills, movements.

VIII. *Animals which sleep in winter.*—Examples: squirrel, dormouse, common snake, frog, toad, snail, slug. Preparation made for sleep.

B.

I. *The Mole.*—Shape, snout, teeth, paws, claws, eyes, ears, fur, food.

II. *The Hedgehog.*—Covering of spines, how it rolls itself into a ball and why, head, teeth, food.

III. *Common Snake* (compare with Viper).—Shape, covering, teeth, how it moves, how it swallows its prey.

IV. *Frog* (compare with Toad and Newt).—Movement, capture of prey, breathing, winter quarters.

V. *Garden Snail* (compare with Slug).—Shell, mantle, head, horns, eyes, food, preparation for winter sleep.

VI. *Earth Worm.*—Shape, rings, locomotion, food, usefulness.

VII. *Spider* (contrast with Bee).—Shape, segments, legs, eyes, jaws, spinnerets, web, breathing organs.

C.

I. *Paws and Claws* and their uses.—Cat, dog, rabbit, mouse, mole, frog.

II. *Tails and their uses.*—Horse, cow, donkey, dog, cat, monkeys, harvest mouse.

III. *Tongues and their uses.*—Cat, dog, cow, woodpecker, frog.

IV. *Teeth and their uses.*—Man, cat, cow, horse, rabbit, snake, fangs of poisonous snakes.

V. *Hair, Fur, Wool and their uses.*—Cat, mole, dog, sheep, fox.

VI. *Beaks of Birds and their uses.*—Duck, fowl, parrot, sparrow, goat-sucker, heron.

VII. *Feet of Birds and their uses.*—Duck, fowl, swift, owl, etc.

VIII. *Insects.*—Examples: Bee, beetle, butterfly, cockroach, silkworm. Insect development: Legs, wings, segments, mouth, breathing apparatus, ovipositors.

AS AN ALTERNATIVE COURSE, AND ONE SUITED TO ANY SCHOOL, WE MAY FIND SUCH A SELECTION AS THE FOLLOWING OF SERVICE:—

I. *The Water we drink.*—Its colour, its taste. It is a liquid, and so takes the shape of any vessel which may contain it. From water, ice, and steam we may easily demonstrate the three forms of matter—liquid, solid, gaseous.

We find some things float and some sink when placed in water; so water helps us to determine the relative weight of substances. By experiments with sugar and sand, we find out some things dissolve and some do not.

In a future lesson we might question out how water is brought to our houses—The well or the reservoir, the pipes and what they are made of. How water is carried about—Jugs, bottles, barrels, spouts, funnels, etc.

II. *Steam.*—By boiling water in a glass flask we can show that real steam is invisible, hence we know why the white column from the locomotive engine seems to be cut off from the funnel. The white cloud coming from the top of our flask is the steam passing back into water. Show the expansive force of steam by allowing it to force a cork out of the flask.—Story of James Watt.

Hold a piece of cold slate over the issuing steam and note result.

Steam occupies much more space than the water from which it was obtained.

III. *Ice.*—What causes water to turn into ice? Difference in the appearance of the colour of the ice on a pond just frozen over and after the skates have scratched it. Why scratched ice looks white. Through thin ice we can see. Water frozen in our water jugs sometimes bursts them; compare with pipes bursting. Ice occupies more space than the water from which it was obtained. Heat melts ice.

IV. *The Air we breathe.*—(*a*) It occupies space: Press a tumbler, apparently empty, with its mouth downwards upon water. Something will not let the water go up the tumbler very far. Fill a bottle by placing it in a trough of water. Notice the bubbles which arise. Where did they come from? Why our chests alternately increase and diminish in capacity. (*b*) It offers resistance: Move the hand, or a piece of paper, to and fro. (*c*) Wind, its varying directions, wet and dry winds, and why. Warm and cold winds, and why. (*d*) Air is elastic: Place the finger on the nozzle of an air pump, and press the piston down; it flies back. The glass pressed down on the top of the water, when released, jumped up. (*e*) Air exerts pressure: Fill a tumbler up to the brim, and cover carefully the surface with a sheet of paper. When inverted the paper does not fall off. Lift a slate by means of a sucker. (*f*) Air is invisible: Compare with coal gas if the tap of the gaspipe is turned on. Compare also with the vapour steam which was invisible. (*g*) Air has weight: Take the collapsed inner tube of a bicycle wheel. Weigh it. Inflate it, and weigh again.

CONFERENCES WITH PRACTICAL TEACHERS.

Second Paper next Month.

SCIENCE NOTES.

Moisture and the Vitality of Plants.—It is often stated that seeds, spores, and mosses without any loss of their vitality can undergo complete desiccation. This is a mistake. Dr. Ewart's recent experiments with regard to this point show conclusively that you cannot deprive them of the water contained in them entirely without destroying their vitality. He has found that the minimum percentage of water that is sufficient to maintain vitality is from two to three per cent. of the dried organism. Protoplasm, which contains the minimum amount of water necessary to maintain vitality, is perfectly dormant. It can neither respire nor assimilate. It can neither add to its substance nor diminish it.

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The Olive Tree in Australia and South Africa.—The olive tree is being cultivated in Australia and South Africa, large numbers of the tree having been introduced from the Naples district for this purpose. The olive ground in Italy is estimated officially at 908,072 hectares, that is, roughly speaking, about 2,270,189 acres, the finest table oil being produced in the province of Lucca. The olive tree is very independent of soil, and will flourish equally well in deep cultivated soil, or on rocky hillsides. The worst enemy of the olive is *Dacus oleae*, a small fly, the female of which has a spike like a wasp, with which she punctures the fruit and deposits an egg in the lesion. When these eggs develop into larvæ, they completely tunnel the olive, leaving nothing but the outer shell and the stone. A single fly will thus destroy three or four hundred olives.

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Canaigre, the New Tanning Material.—Canaigre, the root of *Rumex hymenosepalus*, is found in California to be a most valuable tanning agent. It gives great tensile strength to light leathers, and is far better for split leather than gambier, oak, or hemlock. The yellow colour absorbed by the hide in the process of tanning is considered very desirable for some leathers, and it is a quick tanner. The sliced and dried tubers contain an average of about thirty per cent. of tannic acid, and are worth about eight or nine pounds per ton. The rapidity of its growth recommends it as a suitable plant for farmers with small means to cultivate, and it is likely to be much grown in countries that are suited to its cultivation.

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A New Variety of the Victoria Water Lily.—One of the most interesting plants that has been grown at Kew during the year 1897 is a new variety of the Victoria water lily. It was raised from seeds of the *Victoria Regia* received from Philadelphia, and is noted for the extraordinary vigour with which it flowers, and for its flowering more freely than the type. It differs from all other forms in the pale green colour of its leaves, which are of a rich red colour underneath its turned-up rim, which is from six to eight inches high, the absence of spines on the calyx lobes, and the time when its flowers expand, which is early in the afternoon instead of about six o'clock.

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An Injurious X-Ray Photograph.—An instance of the injurious effects that may follow from the injudicious use of the X-rays is reported in the *American Journal of Dental Science*. An X-ray photograph was taken to determine the exact cause of an intense pain in the jaw which was supposed to arise from necrosis. It was not a success, so another was taken the next day with an exposure of twenty minutes. A few days afterwards the patient's face began to swell. It grew black, and the hair on one side began to fall out, so that a part of the scalp grew bare. Her face was blistered, and sores formed all the way down her neck, shoulder, and arm. Her left ear swelled up, and she lost the sense of hearing in it. Frequent applications of oil were necessary to allay the pain resultant on the exposure of the flesh to air.

HOW TO TEACH MAGNETISM AND ELECTRICITY AS A 'SPECIFIC SUBJECT.'

BY B. ELDERKIN.

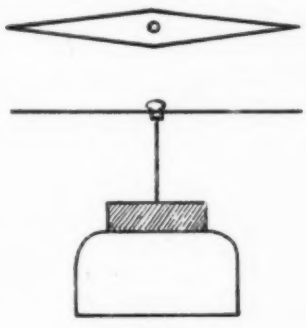
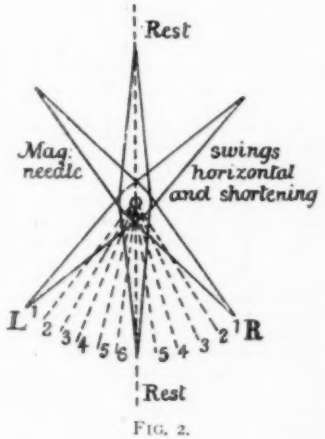
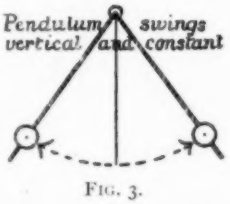
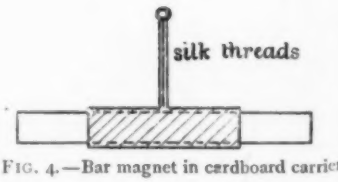
Model School, Westminster Training College.

FIRST YEAR'S COURSE.

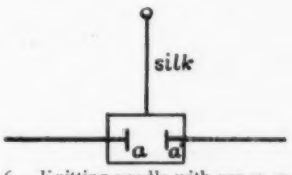
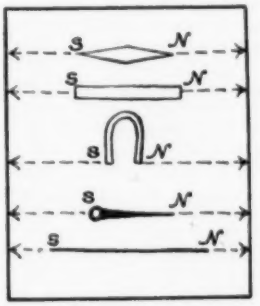
MAGNETISM—Lesson 3.

Object of Lesson.—To show the second property of a magnet.

Apparatus.—A magnetic needle, bar and horseshoe magnets, sewing and knitting needle, a large glass or earthenware bowl of water. Silk threads for suspending magnets. Large brick of wood capable of floating the bar magnet. The magnetic needle can be made, but it needs to be so well balanced that it will be advisable to buy one. The best *stand* for it is a sewing needle pushed eye downwards into the cork of a bottle.

Heads.	Matter and Truths Taught.	Teaching Methods.	Diagrams as Illustrations.
I. The Magnetic Needle	1.—(*a*) This is a thin sheet of steel balanced on a sharp hard point so as to obtain free horizontal movement. (*b*) It is pointed at each end to lessen its weight and friction with the atmosphere. It needs to get free movement. (*c*) It has been magnetised by drawing it across one end of a strong magnet. It possesses all the properties of a magnet. (*d*) When balanced on a sharp point it— (1) swings backwards and forwards for a considerable time. The swings *shorten* each time; (2) Finally comes to rest in a certain position from whatever point the needle may be left to swing.	1. (*a*) Show the needle and let every feature of its shape and construction be noted by the class. Allow scholars to handle it. (*b*) Its shape may be *compared* to a boat and contrasted with that of the Bar Magnet. (Fig. 1.) (*c*) Recall the tests previously used and dip each end in the iron filings. Show how a piece of *crinoline steel* will pick up iron filings after being drawn across the end of a magnet. (*d*) (1) Perform this experiment several times from different starting points. Let the scholars notice the oscillations, and *count* them. Call attention to the *shortening* of the swings. (Fig. 2.) Contrast them with the pendulum of a clock. (Fig. 3.) (2) The needle should stand on a blackboard lying flat on the table, and a line should be drawn to the edge of board showing direction when at rest. It will always come to rest on that line, or parallel to it. (See Fig. 7.)	 FIG. 1.  FIG. 2.  FIG. 3.
II. The Bar and Horseshoe Magnets.	1. The Bar Magnet has the same property, which can only be shown when it is placed so as to be free to move horizontally. 2. The Horseshoe Magnet also possesses the same property.	1. Remove the magnetic needle, and perform this experiment: Either suspend the bar magnet by several silk threads and a light cardboard carrier, or float it on the wood block on the water. The effect will resemble that of the needle. Note carefully that it comes to rest either on the line drawn on the board or on one parallel to it. 2. Suspend by untwisted silk, and precisely the same result follows. Continue to draw lines on board every time magnet comes to rest.	 FIG. 4.—Bar magnet in cardboard carrier.

MAGNETISM—Lesson 3.—(*continued.*)

Heads.	Matter and Truths Taught.	Teaching Methods.	Diagrams as Illustrations.
III. Experiments with *made* Magnets.	1. Sewing needles if magnetised by the method above explained show the same property.	1. Rub needle from end to end (always the same way) with one pole of a magnet. Float it on the water on a small piece of paper. Let the class watch and state the result. Compare direction with lines on board. Treat similarly a knitting needle. Suspend it by a small paper carrier and untwisted silk, made as shown.	 FIG. 5.  FIG. 6.—Knitting needle with paper carrier; *a* and *a*¹ are two *slits* through which needle passes
IV. Truths to be learnt.	1. All Magnets being free to move horizontally come to rest in a certain position. 2. This direction is in England towards the North and South poles of the earth. 3. From this circumstance the poles of the Magnet are sometimes named the *North and South Seeking poles* respectively.	1. Review experiments. Call attention to the parallel lines on board, and get scholars to state result of the experiments as fully as possible. 2. Associate as far as necessary with Geography. 3. This must be told.	 FIG. 7.—Blackboard after experiments.

BLACKBOARD NOTES.—1. Description of magnetic needle. 2. Action of magnetic needle on a point. 3. Experiments with bar magnet when floated or suspended. 4. Experiments with horseshoe magnet hung by silk. 5. Experiments with magnetised sewing and knitting needles. 6. The second property of all magnets. 7. The names of the two poles.

UNSEEN READING TESTS

FOR STANDARDS VI. & VII.

HIS first design was on Benares, a city which in wealth, population, dignity, and sanctity was among the foremost of Asia. It was commonly believed that half a million of human beings was crowded into that labyrinth of lofty alleys, rich with shrines and minarets and balconies, and carved oriels, to which the sacred apes clung by hundreds. The traveller could scarcely make his way through the press of holy mendicants and not less holy bulls.

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Modern buildings, extensions and improvements, have much impaired its fresh unsophisticated charm, and yet it is a place that it will be difficult to spoil. The church tower of flint work is one of the finest specimens of that style of architecture, and the recently restored chancel has completed the spacious and beautiful building, in which Christians of many denominations with every recurring season find it good to worship. Cromer has its enthusiasts; we are not ashamed to enrol ourselves among them. Yet other places on this singularly attractive coast have their equally ardent votaries.

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There can be little doubt that this vast empire, powerful and prosperous as it appears on a superficial view, was yet, even in its best days, far worse governed than the worst governed parts of Europe now are. The administration was tainted with all the vices inseparable from the domination of race over race, and with all the vices of Oriental despotism. The conflicting pretensions of the princes of the royal house produced a long series of crimes and public disasters.

The impression which the first sight of Oxford makes upon the stranger is probably unique, in whatever direction he first approaches it, and from whatever point he first descries its spires and towers. True, of late years the accessories of the railway invasion, so long resisted by the University authorities, have given a new aspect to the scene; but nothing can quite destroy the stately dignity and venerable calm. The traveller who approaches by the river receives the full impression. As he floats along the quiet stream the stately domes and towers come suddenly into view, and the green railway embankment in the foreground scarcely impairs the antique beauty of the picture.

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For there was one point in which even Shakespeare failed; and the admiring reverence with which we join the throng of pilgrims to the shrine, never passes into worship. We mean, of course, such worship as a merely human being may supposably claim; and in view of the highest possibilities of our nature, we mark in him a certain limitation on the heavenward side of his genius.

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Stranger! behold that roof appearing
Through trees, their lofty branches rearing,
As if to brave the tempest's wrath,
Or dare the lightning in its path.
No gaudy pomp the eye repelling,
Is lavished on that lovely dwelling,
But classic elegance and taste
Have every fair proportion graced.
Those pure white columns meet the eye,
In Doric, chaste simplicity,
Around whose base, the fragrant vine
Frolics with many a graceful twine.

THE PRINCIPLES AND PRACTICE OF CLASS TEACHING.

II.—SUBTRACTION.

IN oral work, subtraction and addition **should both be taught at the same time,** but it is generally found convenient to leave over the **slate practice** of subtraction until some fluency has been reached in addition. The elementary oral practice which was recommended as a preparation for addition should always be used so as to prepare for subtraction also. The number lessons on the ball-frame should keep both in view. If the lesson be on the number 'seven,' for example, when the seven is divided into two groups, say 5 and 2, and the pupil is shown that 5 and 2 are 7, he should also be shown that when the 5 is taken from 7, the 2 remains, and when the 2 is taken, the 5 remains. So with every elementary number lesson—whenever addition is practised, subtraction must be kept in view at the same time. But in the early slate lessons it is better to take addition alone for some time in order to avoid confusion. The general principle in all elementary teaching is to 'divide and conquer'—to make progress easy by taking the difficulties one at a time.

The first formal exercise in subtraction should deal only with single digits—subtraction of **units from units.** The second series will consist in the subtraction of **tens from tens,** and to this will soon be added units also, such as 23 from 46, but **without the use of carrying.** Up to this stage no number greater than 9 has to be dealt with, and the work is easy and pleasant until the difficulty of 'carrying' arises.

'Carrying' is the only real difficulty to be faced. An example should be chosen in which only one case of carrying occurs, and the general principles explained from this. The pupil is first required to subtract 21 from 73, for example, and this he does easily. He is next required to subtract 25 from 73. Here it is plain that the old method will not serve; 5 units cannot be taken from 3. The pupil is reminded next that the 7 tens consist of 70 units, and these may be used. But only one of the tens is needed; accordingly we take a ten from the 7 tens and break it up into 10 units: now we have 13 units; and taking away the 5, we get 8 as answer in the units place. We deal with the tens next. We already took away 1 ten from the 7, and now there are 2 tens to be taken away—in all, 3 tens; 3 tens from 7 tens leave as answer 4 tens.

7	3
2	5
4	8

A common method recommended in text-books on this subject is to write the decomposed ten in the units column as 13, and at the same time to score out the 7 and re-write it 6; then in subtracting the tens the pupil takes 2 from 6 instead of 3 from 7. It may be useful at first to write the decomposed ten in this way along with the 3, but to re-write the 7 as 6 is cumbrous and confusing. The pupil is required to perform the subtraction of 1 ten from 7 tens before he gets his units column finished, and then to come back and subtract in the tens column again. Since that 1 ten and the 2 tens in the lower line *must both come from the 7 tens*, the natural way is to take them both away at once.

6	
7	13
2	5
4	8

The extent to which this method may become unwieldy is best seen by taking an example such as 10,000 — 9. But of course the pupil would in all probability have been taught to discontinue the re-writing before so difficult a problem would be given. Apart from this disadvantage, however, the method is sound and easily comprehended. As a matter of fact, it will generally be found that any teacher's preference in this matter, whether he shall teach his class to say '2 from 6' or '3 from 7' in the tens place, depends chiefly on the method he has been taught as a child. There is, however, one point about the latter form that counts for something. After saying '13' in the units line, it comes natural to a child, on the analogy of addition, to add 1 to the 2 in the tens line, though for a different reason. Thus there is little danger of the mistake being made of taking 2 from 7 in the tens line—a mistake which re-writing the 7 as 6 is partly designed to avoid.

If the process be gone through with concrete things, 7 bundles of 10 sticks and 3 single sticks, the teacher can show the use of the decomposition very clearly. Five single sticks are to be taken away to another part of the table; only 3 are available. Accordingly a bundle of 10 must be untied, and 13 are now ready for use. Five of these are put aside, leaving, as the pupil may see by counting them, 8 in the original place. Next, two bundles of 10 are wanted to place beside the 5 sticks. These are also taken away from the seven bundles and put aside. Then 4 bundles are found to remain. But it can serve no good end to stop after taking away the one bundle and count the remaining six. Accordingly it is clear that the re-writing of the 7 as 6 is not only cumbrous in practice but useless in the concrete example.

The method here described, which we have seen to be **decomposition with a deferred subtraction of the decomposed ten,** is generally explained in text-books as resting on an entirely different theory, that of **equal additions.** This theory is based on the fact that when equal quantities are added to unequal, the difference between the unequal quantities remains unaltered. Thus the difference between 3 and 8 is the same as the difference between 13 and 18, or 23 and 28. Since, then, in our example, we added 10 units to the 3, and afterwards 1 ten to the 2 tens in the lower line, it is explained that we have added 10 to each line of our subtraction; then it is further explained that as this is a difficult principle for children to understand, consequently the method of decomposition is preferable.

There is no doubt at all that decomposition is the preferable method, and it may be added that the ordinary theory of equal additions is not only an undesirable one but an impossible one. But the method first explained is really, as we have seen, that of decomposition, differing only from the later decomposition method in being one step shorter; the deduction of the decomposed ten is deferred until the units column has been finally settled, and then completed along with the deduction of the 2 in the lower line. There is no 'equal addition' required for an explanation.

One or two points may be further explained for the sake of clearness:—

1. Equal additions alone will not serve our purpose. If we add ten to each line, as exponents of this theory assume, we have now to take 35 from 83, which is quite as difficult as to take 25 from 73—that is to say, it is impossible, unless we not only *add* the ten, but at the same time *regard it as* 10 *units* (in the upper) *instead of* 1 *ten* (as in the lower line). We have therefore to decompose as well as to add the ten. So the theory is really no explanation at all unless accompanied by decomposition. There is no choice possible between the two theories.

2. There is a method of using equal additions, but not by adding ten—in fact, ten is the only number which never can be used for this purpose. In our original example, 73 — 25, the best number to add to each line is clearly 5. The example then stands as 78 — 30, and the answer can be written down by the pupil who has not mastered 'carrying.' If the teacher chooses to use equal additions as his method, which is not at all likely, the best rule is to add such a number to both lines as will leave a cipher in the lower line, but never to add 10, which leaves the difficulty entirely untouched.

3. The theory of equal additions depends on a different view of the problem involved in subtraction, and a less easy view for children than that of decomposition, when applied to concrete things. *It views subtraction as a process of measuring the difference between two quantities, not as the taking of a certain number of concrete things from a larger heap of them, and discovering how many are left.* Now the process of telling the difference is much more abstract than the other, and much more remote from the notions which are made use of in early addition and other numbering exercises. If the teacher use such an illustration as the 7 bundles of ten and the 3 loose sticks, he will find it impossible to use any method but decomposition to represent on the slate or blackboard the actual steps he takes in dealing with the concrete things. The only intelligible way to show how subtraction of the figures on the board corresponds to the actual 'taking from' which it represents, is to use the decomposition method.

Many teachers use a modification of the decomposition method which is worth notice. In the example already used, when the ten is taken from the 7 tens it is not added to the 3 units to make 13; the 5 units are taken from that ten, and the remainder then left added to the 3 gives the answer 8. This method has one obvious advantage—**the pupil never has to subtract from a number greater than 10.** Again, when **compound subtraction** is taught, the method which is certainly the best is quite analogous to this use of ten in simple

subtraction. It is a method which can be easily illustrated by the concrete example referred to, and it has undoubtedly produced very good results under teachers who believe in it and use it intelligently—two things which are indispensable to the success of any method.

NEEDLEWORK FOR PRACTICAL TEACHERS.

By the Author of 'Blackie's Manual of Needlework.'

WHILE THESE NOTES ARE WRITTEN SPECIALLY TO MEET THE REQUIREMENTS OF CERTIFICATE CANDIDATES, THEY WILL BE FOUND USEFUL BY **ALL TEACHERS** WHO HAVE TO PREPARE FOR EXAMINATION IN THIS SUBJECT.

FIRST YEAR.

A.—How to Make up the Skirt of the Overall.

(*a*) *Seams.*—If the selvedges of the back and front widths are left *on*, the seams would be sewed together on the wrong side.

Otherwise the seam might be a run and fell, sew and fell, or counter-hem. For thin materials a mantua-maker's seam might be used.

These seams were described in the November and following numbers of the Practical Teacher.

(*b*) *Hems.*—The depth of these will depend on the length of the pinafore, but from 1½ to 3 inches are usually allowed. They may be hemmed, stitched, hem-stitched, or feather-stitched, according to taste.

(*c*) *Tucks.*—These are not absolutely necessary, but two or three tucks, each ¼ inch wide (or a single deep one) improve the appearance of the garment.

(*d*) *Placket-hole.*—The back-opening should be from 6 to 9 inches long. The simplest way is to finish the *right* side by a broad hem, ½ to ¾ of an inch wide, and the *left* side by one about ⅛ of an inch wide. Lap the broad hem over the narrow one, and secure it at the foot by two rows of stitching ½ of an inch apart.

Strengthen it on the wrong side by a straight strengthening tape.

When a placket is finished in this way, the opening must be cut a little to the *left* of the centre to allow for the *extra width* of the hem on the right-hand side.

(*e*) *Gathering the top of the skirt.*—Leave from 1 to 2 inches plain on each side of the armhole. Divide the remainder into halves and quarters, and gather it in the usual way if the skirt is to be inserted between the folds of a double yoke.

If the skirt is to be fastened *above* the yoke, turn down a hem to the wrong side of the skirt after the top has been lightly overcast; then gather the double material in two or three rows ½ of an inch apart.

B.—Remarks on Gathering and Pleating.

Every student knows in some degree how to gather and pleat, but there are a few mistakes which examiners constantly come across which I wish to allude to.

I.—*Gathering.*

(*a*) 'Gather the *weft* way of the stuff,' so that the selvedge runs up and down the exercise, is generally the first rule given for gathering, yet many students ignore this altogether, with the result that the stroking (however much labour may be bestowed on it) is not so well done, neither do the gathers set nicely.

(*b*) Never gather *across hems.*

(*c*) Gather on the *right side* of the material, and to insure *evenness*, make a crease from ⅛ to ¼ inch from the top of the part to be gathered.

(*d*) Gather with a *coarser thread* than that used for the other stitches. No. 36 will go well with No. 50; No. 40 with 60. Do *not* gather with *double* thread lest it knot and get entangled, except when it is advisable not to use a needle which might *make holes*, as in muslin and other very thin materials.

(*e*) Always *pass over twice as much* of the material as you take up on the needle, whatever the texture may be. Take up $\frac{1}{16}$ of an inch, pass over ⅛, and so on.

(*f*) Do *not* begin gathering with a *knot*. Take a *running* stitch, and leave about ⅛ inch of thread; make one or two back stitches over this running stitch, and draw the half inch of thread left at the beginning through each *loop made by* the back stitches before drawing it closely up to the calico.

(*g*) When a *long piece has to be gathered*, do not risk the breaking of the thread by the too heavy strain; begin a new one at the half and quarters.

(*h*) Remember that, though for examination purposes and ordinary garments gathering is generally done on *single* material, still it is sometimes done on *double* or even *triple folds*. A muslin pinafore attached to a yoke of insertion would have a narrow hem turned down on the right side of the skirt, and the gathering would in that case be on a *threefold* texture. If the skirt of an overall were to be placed *above* the yoke, then after the top edge had been slightly overcast, a fold would be turned down on the *wrong* side of the skirt, and two or three rows of gathering down on the *doubled* material.

II.—*Stroking.*

(*a*) Avoid stroking with an *ordinary pin*. Use the head of a darning or straw needle, or the point of a steel pin.

(*b*) Stroke the part *above* the gathering thread as well as that below. You may do this in two ways:—(1) by stroking all the gathers *below* the gathering thread, and then turning the work completely round to do those *above*; or (2) stroke the half of each gather above the gathering thread, and then the other half *below* it.

(*c*) See that your stroking does not consist of *scratching* the cloth, but simply of *lifting up each little* 'ruck' and laying it under the left thumb.

(*d*) Stroke each gather to the *same depth* (about ½ inch is sufficient), not one gather ½ inch, the next ⅝, the next ¾, and so on.

III.—*Setting-in gathers.*

(*a*) See that the *front* edge of the band lies *on* or *immediately above* the gathering stitches.

(*b*) *Each gather* must have its *own* setting-in stitch.

(*c*) The setting-in stitch (if the part gathered is double the length of the band to which it is to be attached, as it ought to be) should be an *upright* one on the *right* side, and a *slanting* one on the *wrong*, and the *even* stitch will be *between* each 'ruck' or gather.

(*d*) Be as careful in working the *wrong* side of the band as the right, else the band will get twisted. The back edge of the band should be a thread or so *above* the gathering stitch, so that the stitches on the *wrong* side may not appear on the right. Many a specimen of gathering (otherwise very well done) is simply spoiled by neglecting this small detail.

IV.—*Pleating.*

Remarks *a*, *b*, *c*, of Gathering, Part I., apply to pleating as well as gathering.

(*a*) *Single* pleats are chiefly used for chemises, aprons, and petticoats; *double* or box *pleats* are employed at the foot of the front folds of skirts, etc.

(*b*) The *spaces* between pleats should always be *regular*.

(*c*) If pleats face towards the centre of the garment, the fulness is meant to be *in front*; if they fall towards the back-opening, the fulness is intended for the back and sides of the garment.

(*d*) The rule for the proportion of *garment to band in specimens* is from 2 *to* 3 *times the length* of that part of the band into which the pleats are to be inserted. But the proportion varies according to the width of the pleats required and the kind of garment on which they are used.

(*e*) Pleats are almost invariably used in flannel garments, and all *paper* garments *must be pleated*, as gathering is impossible on that material. A graduated card or stiff paper tapeline 4 or 5 inches by 1 will be found invaluable in pleating.

SECOND YEAR.

A.—Woman's Nightdress.

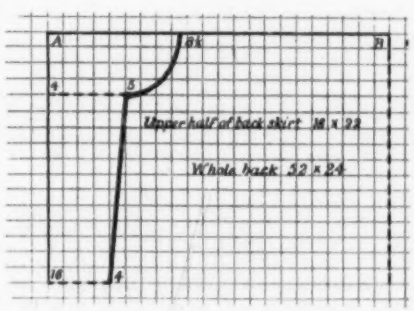

Fig. 1.

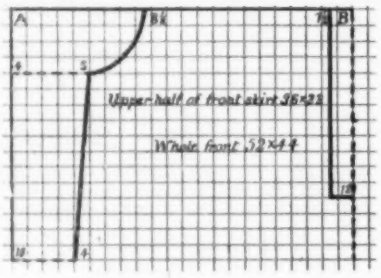

FIG. 2.

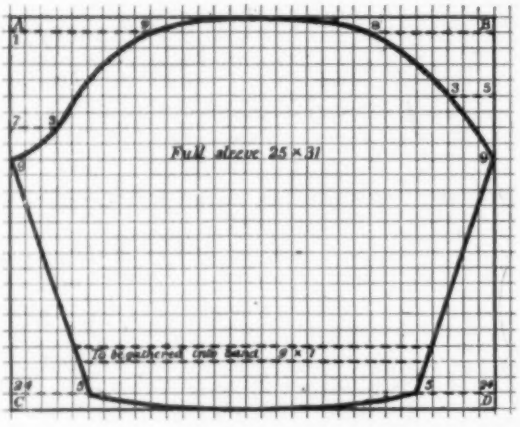

FIG. 3.

FIG. 4. FIG. 5.

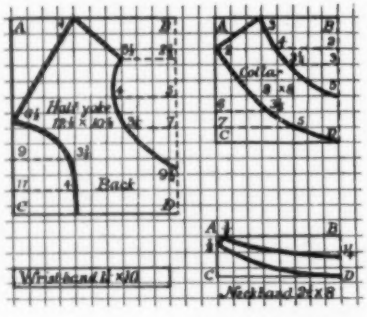

FIG. 6. FIG. 7.

B.—SLEEVES, WRISTBANDS AND CUFFS OF NIGHTDRESS.

In the January number of this paper patterns were given of a *full* and a *plain* sleeve, and another diagram of a full sleeve is to be found *above* these remarks. The plain sleeve is most suitable for examination purposes, but the full sleeve is the more fashionable. A plain sleeve is generally made up with a *simple* wristband or a cuff, Figs. 1 and 2. The full sleeve is meant to have a band put on where the dotted lines are inserted, Fig. 3, so as to leave the under part for a frill.

(*a*) *Seams.*—The seams should correspond with those of the skirt as regards both the *kind* of seam and their facing to right and left.

The cross side of the sleeve is the *under half* of it.

(*b*) *Wrist-opening.*—If the sleeve is to be finished with a plain wristband fastened with a button and buttonhole, then a wrist-opening must be left at the foot, about half the length of the wristband. This opening should have a hem all round it, ⅛ of an inch deep, and the foot may be strengthened with a loop or a tiny gusset.

The following illustrations will show what is meant :—

FIG. 1.

FIG. 2.

FIG. 3.

FIG. 4.

FIG. 5.

(*c*) *Fulness.*—From 1½ to 2 inches should be left plain on *each side* of the seam or opening. The rest may be gathered, tucked, pleated or smocked. Gathering is more suitable for calico, tucking for muslin and fine calico, see Fig. 4 ; pleating and smocking for flannel and flannelette, Fig. 5.

(*d*) *Wristbands.—Half the length of the sleeve* is the usual length of the wristband, when closed to slip over the hand. When it is open, half of the length of the collar band + 1 inch is generally allowed. 9 inches × 1 when finished is the usual size of a wristband for a woman's nightdress. A plain wristband is double and is ornamented with stitching, feather-stitching or tiny tucks. Lace or embroidered frilling may be whipped up and attached to the edge, or the embroidery may be gathered and inserted between the two folds of the band.

(*e*) *Single Bands.*—When the sleeve is made sufficiently long to have its frill of itself as in Fig. 3, gather two rows where the *dotted lines are*, stroke above and below each and sew on a single feather-stitched band (⅝ of an inch wide when finished) or one of embroidered insertion, so that it shall lie between the two rows of gathering.

A ribbon may be drawn through this insertion if desired.

If the frills are inserted then they *may* be made more shapely by having them 2½ inches deep in front and 4 or 4½ at the back.

THE INSPECTOR'S NOTE-BOOK.

BY AN INSPECTOR OF SCHOOLS.

Word-building 'in extremis.' Word-building as a sole means of teaching spelling has been weighed in the balance and found wanting. We cannot teach such an anomalous thing as spelling by scientific processes. The sooner that is recognised the better for the scholars. It is a useful plan to take 20 or 30 new words *per diem*. These should be carefully selected and written in an ordinary exercise book for reference. If the subject be weak, place it on the Time Table for 20 minutes daily, *e.g.*, 9.40—10 directly after the scripture lesson; or, 2.10—2.30. Spend half of this time in testing either orally or better by writing. Do not give too much dictation from the reading-books. The proper method is to make up a piece containing some of the 20 new words learnt, say the day before.

* * * * * *

Repetition and continuity of teaching. In this subject as in all others it is repetition and continuity of teaching that pay. The thoughtful teacher keeps an account of words taken, underlines those found to be the most difficult by the scholars for repetition, and is careful only to give the class suitable words associating and contrasting wherever possible. It is often the case that children who can pass muster at the regulation 8 lines unseen parade are unable to spell correctly a simple and homely sentence or two. As an Inspector I find it quite sufficient for testing purposes to confine myself to the simple things. Some masters have drawn up a list of the chief words in ordinary every-day use for conversation and letter-writing, and has arrayed these in groups suitable to each standard. This is a practical way of doing things. Occasionally in the upper standards it is well to devote a lesson to oral spelling. One can get through a long list in this way in half an hour. It should be borne in mind that the average lad who can spell, read and write well, will be better placed when he leaves school than the lad who cannot spell but knows a fair amount of elementary science.

* * * * * *

Dr. Kemsies, a German head-master, experiments. There is one way of regarding the newer methods of teaching suggested by a writer, by name Dr. Kemsies, head-master of a large German school. With the characteristically national love of experimenting and observing he has arrived at some interesting conclusions respecting the conditions influencing the working capacity of scholars. He tells us that the best work is done at the beginning of the week after the Sunday holiday; that better work is always done in the morning than in the afternoon; and that by Tuesday afternoon the effect of the week-end rest begins to depreciate and less satisfactory work is done.

* * * * * *

Intelligent teaching—brain fatigue. The intelligent methods now being used, whilst they are educationally very commendable, yet produce brain fatigue sooner. Even physical exercises as such are not much recreation for the brain. According to Dr. Kemsies, gymnastics ordinarily classed as play 'produce the greatest fatigue of all, rendering the work done after it practically useless.' In commenting upon this paper a contemporary says—

> 'It must not be forgotten that the effort to make teaching interesting, which is its great characterestic in modern times, does not really lighten the burden on the child. It makes learning easier, but it makes him learn more; it keeps him always at it, and it steals from him those moments of torpor and stupidity, of dreams and vacancy, in which his little brain used to take furtive snatches of repose.'

Whilst not committing myself to the opinions here expressed it seems to me much food for thought lies within them. In any case it is well for us to know what those unconnected with teaching think of the latest developments.

* * * * * *

How to spend the first hour and half. How do you spend the first hour and half in the mornings? Some do not really get seriously to work until 10 o'clock.

It is not wise to give an hour or 50 minutes to scripture. If prayers are over by 9.5 quite a lot of Bible teaching can be done by 9.30 by a smart teacher. Then come on with 10 minutes tonic sol-fa, and next give the children 15 minutes spelling, mental arithmetic or class work. This takes you to 9.55, when you close the register. I believe strongly in starting the morning with a short crisp and intelligent oral lesson. Arithmetic should always be taken next. Its place is at the beginning of the day. Take reading next and finish with some dictation and composition. Remember the lessons which are not a great tax upon the brain. Place them at the end of the day.

* * * * * *

ANSWERS TO CORRESPONDENTS.

A.G.E.—You cannot be twice re-examined for purposes of raising your certificate in successive years. One year must intervene.

Inquirer.—(1) Yes, certainly, take both parts of the examination, unless you feel confident of a first division in Part I.

(2) The marks for reading, recitation and teaching have to be forwarded to the Department by H.M. Inspectors on or before the 1st of May.

(3) You must get your managers to apply for you. The Education Department conduct all correspondence concerning the school through the correspondent.

(4) Moffatt and Paige publish the Certificate questions for the last six years, with answers to the Arithmetic Algebra—3s. 6d.

F.W.—I advise you to write H.M.I. a respectful letter, stating that you think you can do better now in reading and recitation than you did in 1896. At the same time it appears to me that you might do as much good or even more by spending the time on the other subjects. You would only gain about 15 to 20 more marks at most in reading and recitation, and perhaps not so many.

M.M.—You cannot sit until 1899, when you may take Part II. only.

W.A.W.—(1) The parchment can now be obtained upon application after 18 months continuous service in one school. Yours will be obtainable after January 31st 1899.

(2) Yes, under Art. 115 B.

(3) The third year's training refers only to ordinary students.

(4) No, not excused. Should you unfortunately get a 2nd your previous 1st would prevail.

J.F.—Your son is not a Pupil Teacher until his indentures have been signed. The Education Department forwards them to the Managers. According to the present Code no person can be apprenticed under 15 years of age. You should ask the Board to apprentice him for three years (see Art. 40). Until apprenticed he is regarded simply as a candidate, although he may have passed the first year examination.

K.H.—You must take Physiography unless you passed in it in your 1st year. If you passed in it then you may substitute another science (Hygiene, Physiology). Your second subject must be the second one selected in your first year unless that was Chemistry or Physics. If you did not take a second one you may take any one of the following :—viii., ix., x., xiv., xvii., xxv.

H.R.B.—None of the examinations resemble the Q.S. Examination. I recommend that by the National Froebel Union, but I cannot hold out much hope of success to a person who has gone down twice in the Q.S.

J.F.B.—You do not say whether or not you are certificated. I assume you are.

(1) Yes, you may teach drawing. The 'D' is not yet a *sine qua non*.

(2) Yes. Agriculture.

(3) There are no definite qualifications demanded in order to teach cottage gardening. The Education Department must be satisfied that the teacher is qualified, and the Inspector of the District is the judge of this.

(4) Certainly an Article 68 can sit for Q.S.

W.C.—(1) You may sit again in July 1899.

(2) You cannot take more than two sciences at the Certificate Examination.

(3) No. Why do you think it absolutely necessary?
(4) Meiklejohn's History, 4s. 6d.
(5) Blackie's Practical School Method.
(6) If you have passed in Freehand you must take Model.

F.G.W.—Judging from the particulars you give me I agree with the Lady Principal in not advising her to return to college. Should she become quite strong again she could take the 2nd year examination outside college. If then she was very anxious for another year's training she could get one year under Art. 115*b*. The Department would make no allowance on account of her ill health. If she was at college and broke down just before the examination the Department might then allow her the examination. It makes very little difference to the average girl whether she be trained or not. Let her health be the first consideration.

S.M.—Yes, you must take History.

Write for a syllabus of the Certificate Examination to Secretary Scotch Education Department, Whitehall, London. You will find it contain all the information you require. Send me the syllabus if you do not understand any part, and I will do my best to help you. Underline the part referred to.

Civis.—The salary is £150, rising £10 per annum to £300.

W.H.E.—The song is entitled 'The Children's Home.' You can get it for about sixpence. Order from any music seller.

I don't quite understand your question *re* Drawing. After March 31st the Education Department will inspect Drawing, I presume, as other subjects are taken. I should think the cards of merit will go with the abolition of the Annual Examination.

Unionist.—By all means go in for a University Degree. Then get some good testimonials and send in an application.

All correspondents desiring a reply by post must enclose a stamped and addressed envelope. Write 'Inspector,' care of the Editor, 33, Paternoster Row, London.

DOMESTIC ECONOMY.

(CLASS SUBJECT QUESTIONS.)

GIRLS.

STANDARD IV.

1. What is meant by the term 'Domestic Economy'?
2. To what has the human body been compared?
3. What is the meaning of the word 'tissues'?
4. Explain the different tissues of the body.
5. What are the chief functions of food?
6. Which do you consider the best food for children? Why?
7. What is carbon? In what different forms is it found?
8. How would you prove that sugar contains carbon?
9. Explain the difference between carbon and carbonic acid gas.
10. What is meant by animal and vegetable food?
11. 'Body warmers,' 'Flesh formers.' Explain what is meant by these terms.
12. Why are all kinds of fats, sugar, and starch called 'body warmers'?
13. What other names are they known by?
14. How are carbonaceous foods divided?
15. Name any foods which contain starch?
16. How would you obtain starch from potatoes?
17. What is the difference between carbonaceous and nitrogenous foods?
18. Where are nitrogenous foods digested?
19. What four things do nitrogenous foods contain?
20. Name all the mineral foods you know.
21. In choosing materials for clothing, what should be borne in mind?
22. What material should be worn next the skin, and why?
23. How would you wash flannels and prints?
24. Give directions for making starch.

STANDARD V.

1. Describe the meaning of the word 'matter.'
2. What is the difference between an element and a compound?
3. What elements form the body?
4. What do you understand by digestion?
5. Mention the chief organs of digestion.
6. Explain the meaning of the word 'function.'
7. What are the chief functions of food?
8. Where are fatty foods digested?
9. Mention all the juices which aid digestion.
10. Which requires more food—a dressmaker or a servant girl? Why?
11. What is the function of water?
12. Can a person live on one kind of food? Why not?
13. What do you mean when you say that a person has a good digestion?
14. How are the organs of digestion strengthened?
15. If you could see a piece of skin through a microscope what would it be full of?
16. What is the great use of perspiration?
17. What happens if we do not frequently wash our skin?
18. Why is it necessary that we should wash ourselves daily with soap as well as water?
19. When should you take a cold sponge bath, and why?
20. What would happen if the pores of our skin were closed?
21. Give another name for the pores.

STANDARD VI.

1. What do you understand by a 'food'?
2. Why is it advisable to cook food in different ways?
3. Mention six ways of cooking meat.
4. How would you deal with meat that is rather 'high'?
5. Mention various methods of preserving eggs for winter use.
6. Name the materials which are used for building purposes.
7. What are the chief materials used in your own neighbourhood?
8. 'The natural source of all light and heat.' Explain what is meant by this expression.
9. Mention various methods of heating public buildings.
10. What are the advantages and disadvantages of the open fireplace?
11. How is your own school heated?
12. What is meant by the term 'ventilation'?
13. Say exactly what becomes of expired air.
14. Why should windows be opened top and bottom?
15. What is a great point to be guarded against in ventilating a room?
16. Mention various methods of ventilation.
17. Why is cleanliness so very important?
18. Map out the work to be done each day during a week by a thrifty housewife in a small house.
19. How should dirty and faded carpets be treated?
20. How would you keep cutlery in good condition?

STANDARD VII.

1. How can milk and eggs be rendered most digestible?
2. Mention six ways of cooking potatoes.
3. How would you make a rice pudding?
4. What do you understand by 'goodhealth'?
5. Give any 'rules for health' that you know.
6. What classes of people are the most healthy?
7. Explain the meaning of the word 'disease.'
8. How can diseases be classified?
9. What is the best method of treating a person who has 'smallpox'?
10. Describe the symptoms of 'scarlet fever.'
11. How is a cold in the head best cured?
12. What do you understand by 'alcoholic poisoning'?
13. Explain the following terms:—germs, isolation, sanitary inspector.
14. What diseases are caused by drinking impure water and inhaling bad air?
15. What qualities should a good nurse possess?
16. What furniture should and should not be in a sick room?
17. How would you ventilate a sick room?
18. What drinks are suitable for invalids?
19. What rules with regard to food should a nurse bear in mind?
20. How can a nurse assist the doctor?

A Page of
UNSEEN READING TESTS AND COMPOSITION STORIES
Will appear next Month.

OUR TUTORIAL SECTION

LONDON MATRICULATION.

June 1898.

BY R. C. B. KERIN, B.A. (LONDON),
First in First Class Classical Honours at Final; Principal, Carlyon College, 55 & 56, *Chancery Lane, W.C.*,
AND
E. J. SCHWARTZ, M.A., B.SC.,
Late Scholar of St. Catharine's College, Cambridge.

LATIN.

Course for March.

1. Vergil, 'Aeneid,' Book II., 450-649.

2. Grammar. Learn the verbs of the third conjugation that are irregular in the perfect and supine. In the Syntax note how questions are asked in Latin, the rules for the sequence of the tenses of the subjunctive, the difference of the uses of the tenses of the indicative in Latin and English, the uses of the negatives. Revise the uses of the cases and the declensions again. The nouns of the third declension especially should be learnt again and again, monotonous though the task may be.

3. 'Anglice Reddenda,' 95 to 105.

4. Sentences from Bradley's 'Arnold' or Bayfield or Allen's 'Exercise Book.'

Latin Grammar Notes.

Know the different usages of *haud*, *non*, and *ne* to express 'not.' *Ne* is used in wishes and prohibitions; *haud* is normally used before adjectives and adverbs. Note, however, the use of *haud* with a verb in the phrase *haud scio an*, 'I am inclined to think.' The various interrogative particles used in asking questions are important.

Distinguish the different methods of translating 'whether . . . or.' In a question use *utrum* . . . . *an*. Remember that 'whether . . . . or' in an adverbial clause is translated by '*sive* . . . *sive*.' In some cases it is hard to tell whether the clauses are adverbial or not. The best test is this: If you can take away the 'whether . . . . or' clause and leave the sense complete, then the 'whether . . . . or' clause is adverbial. If, however, the absence of the clause would leave the sense incomplete, then the clause is an interrogative one. Note the differences between *num*, *ne*, and *nonne* in asking questions.

Remember that *an* is not used in the first portion of disjunctive questions. Where *an* apparently is used in this way there is always an ellipse of the first alternative. Postgate notices some cases in which the tense of the indicative in Latin differs from the tense in English. *Postquàm* is followed by the perfect indicative instead of the pluperfect, if the exact time after is not mentioned, *e.g. postquam cenavimus, Atticus advenit*—'after we had dined Atticus came.' Again, after the words *si*, *cum*, *donec* (until), etc., when the principal verb is in a future tense, the future is used in Latin when the time of the actions expressed by the principal sentence and the dependent sentence is the same, *e.g. hoc faciam cum potero*; we say, 'I shall do this when I can.' *Hoc faciam cum possum* would be bad Latin. If, however, the action of the dependent clause is antecedent to that of the principal clause, use the future perfect indicative in the dependent clause, *e.g. non respondebo donec tacueris*, 'I shall not answer till you are silent.' Here the silence begins before the answer is made, and as the verb of answering is in the future, the verb of silence will be in the future perfect.

The rule for the sequence of tenses must be thoroughly known and applied. I need not lay stress on the fact that knowing a rule is one thing and applying it another. There is, perhaps, no rule which is so often disregarded, even by men who have been a considerable time at Latin. I have often alluded to it in the sentences; I shall, however, sum it up again. This rule regulates the tenses of the subjunctive to be used in dependent clauses. If the verb in the principal clause is in a secondary or historical tense (*i.e.*, the imperfect, pluperfect, aorist perfect), the imperfect or pluperfect subjunctive is to be used. If the principal verb is in a primary tense (*i.e.*, present, future, future perfect, present perfect, and imperative), use either the present or perfect subjunctive. The historical present will be followed by either primary or secondary sequence. For fuller details see the sentences.

Vergil II. 450—649.

451. Note the construction of the infinitive.

453. Note *pervius usus*.

460. Note *turrim* (acc. in *-im*). Learn the other words of the 3rd decl. that have this ending.

Lines 460-475 are very important.

470. Instance of Hendiadys (expression of one idea by two words), 'with the sheen of brazen arms.'

475. *linguis micat ore*, 'quiver at (or from) his mouth with forked tongue' (Page). *Ore* will be local abl. and *linguis* abl. of instrument.

476. *Una*, adverb.

492. *Ariete*, scanned as a trisyllabic word (*synizesis*).

506. *Forsitan* requires the subjunctive. The subjunctive is really the subjunctive of a dependent question.

510. *Circumdat* is followed either (1) by the acc. of the thing surrounded and the abl. of that by which it is surrounded, or (2) by the acc. of the thing surrounding and the dat. of the thing surrounded, *e.g.* either *urbem muro circumdat*, or *urbi murum circumdat*. *Dono* has a similar construction.

522. Note that *eget* governs the abl. or gen.

523. *Tandem*, 'I pray.'

529. *infesto volnere*, 'with ever threatened wound' (Page), 'with a blow aimed at him' (Conington). *Volnus*, 'wound,' is here put for the blow that inflicts the wound.

537. *Persolvant*, optative subjunctive.

540. *Satum* (esse), perfect inf.; *quo*, abl. of origin depending on *Satum*.

548. *Pelidae*, 'son of Peleus' (Achilles). Note the patronymic ending.

551. Distinguish *morĕre* (as here), imper. of *morior*, from *morĕre*, pres. subj. of *moror*.

553. Note *tenus* governing *capulo* and following the word it governs. *Tenus* is sometimes found with the genitive.

556. *populis*, instrumental abl., hence there is no preposition. Papillon regards *populis* as a dative, 'for so many nations . . . lord.'

564. *Sit*, subjunctive of dependent question.

573. *Erinnys*, 'fury.'

574. *aris*, local ablative.

576. *sceleratas paenas*, 'vengeance on guilt' (Page), = *scelerum paenas*, cf. *merentis paenas* below = 'punishment of one who deserves it.'

587. Note the gen. *flammae* dependent on *implesse* (= *implevisse*, syncope). This use of the genitive is a Graecism.

606. *Ne time*, poetical use of *ne* with the imperative. In prose we should have *ne timueris*. Matriculation candidates are not to imitate this. Poetical expressions are out of place in the Matriculation.

628. *Eruere*, poetical use of the inf. to express a purpose.

643. Note *superare* with dat. = 'to survive.'

Typical Sentences.

23. He was so pleased with his lot that he did not repent of having left the city of Syracuse.

Sorte sua tam contentus erat ut non se paeniteret ex urbe Syracusis abivisse.

Notes.—(*a*) *So* before an adj. or adv. is *tam*, before verbs *sic*, *ita*, or *adeo*; (*b*) *contentus* is followed by the ablative; (*c*) 'that' in consecutive and final clauses is expressed by *ut*. Note, however, when there is a negative in the clause, that *ut non* is used in consecutive clauses, and *ne* in *negative final* clauses; (*d*) *paenitet* is used impersonally, and takes acc. of the person and gen. of the thing. If, however, in English you have a verbal noun as in the sentence above, use *not* the gerund, but the *infinitive* or a *quod* clause; (*e*) *Syracusis*, 'from Syracuse'; but *ex urbe Syracusis*, 'from the city of Syracuse,' as explained in previous rules.

24. There are many who think that they can do this at once.

Multi sunt qui se hoc statim facere putent.

Notes.—When a relative has an indefinite antecedent the subjunctive is used in the relative clause, hence *putent*. This use of *qui* is called *generic*. The subjunctive is known as the *generic* or *descriptive* subjunctive.

25. He was accused of murdering his friend, but was unanimously acquitted.

Quod amicum suum interfecisset accusatus omnium iudicum sententiis est absolutus.

Notes.—(*a*) *Of* and a *verbal* noun, when depending on a verb, are never expressed by the genitive of the gerund in Latin. The general way, then, of expressing 'of' and the verbal is by using *quod* (because) and a finite verb. The subjunctive will be used with *quod* if the reason given is the opinion of someone other than the speaker or writer. Consequently, in the sentence above we use *quod* and the subjunctive, as the reason given is evidently that of the people who brought the accusation (lit., 'He was accused because, as they said, he had killed his friend'). This subjunctive is called the subjunctive of *sub-oblique narration*. (*b*) Note the use of the participle *accusatus* and the finite verb *est absolutus* instead of using two finite verbs connected by *et*; (*c*) *sententiis* is the instrumental ablative, hence there is no preposition.

26. So far was he from admiring the deeds of this man that he censured him severely.

Tantum aberat ut huius facta admiraretur ut eum graviter culparet.

Notes.—(*a*) *Tantum aberat ut . . . . . ut*—lit., 'So far was it absent that . . . . . that.' The *ut* in both cases will require the subjunctive; (*b*) note the tense of *admiraretur* according to the rule of the sequence of tenses; the time of *admiraretur* is the same as that of *aberat*, therefore the imperfect tense is used.

Additional Sentences for Practice.

(1) So far is he from stopping at Rome, that he has determined (*constituo*) to set out immediately to Capua.

(2) When he was stopping at Rome, ten days ago, he saw his uncle (*patruus*).

(3) He was accused of injuring this man, and was condemned.

(4) All of them said they were sorry for having told your brother, and promised never to break their word again (*fallere fidem*).

(5) Each of the soldiers hoped to see the General before daybreak.

(6) They were so delighted (*gaudeo*) at the victory that they did nothing else but talk of it.

(7) Let each of our friends remember who carried on the war.

(8) If he had tried (*conor*, c. infinitive) to leave Rome, he would have been accused of treachery (*proditio*) by the General.

(9) The more he praised the General, the less he pleased him.

ENGLISH.

Course for March.

Grammar.—The Alphabet.

History.—Revise from the beginning to the end of Henry III.

English Notes.

Learn the origin of the English alphabet. Know what is meant by Runes and Ogham letters. Know the differences between the Latin alphabet and the A.S. alphabet. Note that the English alphabet is both defective and redundant. Learn the essentials of a perfect alphabet. Remedy proposed for our erratic spelling is to adopt a phonetic spelling. Note the objections to this proposal. Learn lists of words which show the different sounds represented by different letters. The various sounds of the vowels especially are important. Note what is meant by 'etymological' spelling. There is an excellent chapter dealing with this subject in 'Skeats' Small Primer' (published by the Clarendon Press, 1s. 6d.) *Debt* and *doubt* are prominent examples of *etymological* spelling. The history of our spelling is important. Candidates must be able to give reasons for the irregularities in the spelling.

FRENCH.

Course for March.

1. A certain amount of translation and a certain amount of exercises from English into French each week.

2. In the Grammar learn the rules for the formation of adverbs, and revise the irregular verbs.

Notes.

Note the general rules for the formation of adverbs. Note the exceptions. Note the adjectives ending in *-ent* that add *-ment* to the fem. form in order to form the adverb. Note the adjectives ending in *-é* that take an acute accent on the *é* in forming the adverb. Very irregularly formed adverbs as those from *gentil*, *bon*, *mauvais*, etc., are very important.

MATHEMATICS.

GEOMETRY COURSE.

Book III. from Props. 20 to 30 should be read this month, and at the same time the first half of Book I. may be revised, say to the end of Prop. 26.

Solutions to last month's riders:—

1. From the centre of the circle draw a perpendicular to the given straight line. At the point where this perpendicular cuts the circumference of the circle draw a tangent to the circle. It will readily be seen that this is the tangent required.

2. This depends upon the fact that the two tangents drawn to a circle from an external point are of equal length; this is easy to prove directly from III. 17 or by III. 36.

Let ABCD be a quadrilateral, and let its sides AB, BC, CD, DA touch the inscribed circle at P, Q, R, and S respectively.

Then $AP = AS$
$BP = BQ$
$CR = CQ$
$DR = DS.$

By addition the required result follows.

3. Let BCD be a circle. At B draw a tangent BA of the required length. Join A to O, the centre of the circle. Then any point on the circumference of the circle centre O and radius OA will have a tangent of the required length.

We append a few riders:—

(1) Draw to scale a line of length $\sqrt{13}$ inches.

(2) Describe a circle to pass through two given points and to touch a given straight line.

(3) Construct a triangle having given base, vertical angle, and length of perpendicular from base to vertex.

(4) Construct a triangle having given base, sum of sides, and one of the base angles.

ARITHMETIC COURSE.

Chapter XXXIII. and XXXIV. of Pendlebury may be read this month, and many of the examples worked.

It is a good plan to work miscellaneous examples, say commencing at number 400 of the Examination papers given at the end of Pendlebury.

Solutions to February problems:—

1. In 6 per cent. stock at £110

£110 brings in an income of £6.
∴ £1 ,, ,, $£\frac{6}{110}$
= 1s. 1d. approximately.

In 5 per cents. at £109

£1 would bring in an income of $£\frac{5}{109}$
= 11 pence approximately.
∴ the former is the better.

2. Here price of a share $= 97\frac{7}{8} + \frac{1}{8}$
$= £98.$

∴ £1,500 buys $\frac{1500}{98}$ shares.

Now 1 share produces an income of £3.

∴ required income $= \frac{1500 \times 3}{98}$
= £45 18s. 4d. to nearest penny.

Problems for March.

1. Account for the fact that the difference of two numbers composed of the same figures is always divisible by 9, taking as an example the numbers 97654 and 46795.

2. Find by approximate methods the square root of 2 to 7 decimal places.

3. What per cent. is gained by selling tea at 2 shillings a lb. which cost £12 a cwt.?

ALGEBRA COURSE.

Chapter XXVI. of Hall and Knight's should be read, and those who are at home with quadratic equations should read Chap. XXXVI., and in both these chapters plenty of examples are to be worked.

Note that the answers or roots of the equation

$$ax^2 + bx + c = 0,$$

are

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a},$$

so that if we call the two roots α and β we have

$$\alpha = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$$

$$\beta = \frac{-b - \sqrt{b^2 - 4ac}}{2a};$$

$$\therefore\ \alpha + \beta = \frac{-2b}{2a} = -\frac{b}{a},$$

$$\text{and } \alpha\beta = \frac{(-b + \sqrt{b^2 - 4ac})(-b - \sqrt{b^2 - 4ac})}{4a^2}$$

$$= \frac{(-b)^2 - (\sqrt{b^2 - 4ac})^2}{4a^2} = \frac{b^2 - b^2 + 4ac}{4a^2} = \frac{c}{a}.$$

These two results are important.

Note that if the roots of the equation

$$3x^2 - 7x + 2 = 0$$

are found to be $\frac{1}{3}$ or 2, then the factors of the expression

$3x^2 - 7x + 2$ are $3(x - \frac{1}{3})(x - 2)$ or $(3x - 1)(x - 2)$.

We thus have a method of factorizing quadratic expressions, viz., equate them to zero and solve, the factors then are

(coefficient of x^2)(x — one answer)(x — other answer).

Illustrative examples.

1. Find c so that one root of

$$x^2 - 9x + c = 0$$

may be double the other.

Let the roots be α and 2α.

Then $\alpha + 2\alpha = 9$, *i.e.*, $3\alpha = 9$ . . . (1)

Also $\alpha \times 2\alpha = c$, *i.e.*, $2\alpha^2 = c$ . . . (2)

From (1) $\alpha = 3$.

Substituting in (2) $c = 2\alpha^2 = 18$.

2. Solve the equations—

$$\frac{1}{x} + \frac{1}{y} = 5 \quad . \ . \ . \quad (1)$$

$$6xy = 1 \quad . \ . \ . \quad (2)$$

Let $\frac{1}{x} = X$, $\frac{1}{y} = Y$.

Then $X + Y = 5$ . . . (1)

$$\frac{6}{XY} = 1 \quad . \ . \ . \quad (2)$$

or $XY = 6$ . . . (2)

We now have

$$X + Y = 5$$
$$XY = 6.$$

Solving in ordinary way,

$$X = 3,$$
$$Y = 2.$$

$$\therefore\ x = \frac{1}{X} = \frac{1}{3},\ y = \frac{1}{Y} = \frac{1}{2}.$$

Or we could proceed thus:

$$x + y = 5xy \quad . \ . \ . \quad (1)$$

$$\text{But } xy = \tfrac{1}{6} \quad . \ . \ . \quad (2)$$

$$\therefore\ x + y = \tfrac{5}{6} \quad . \ . \ . \quad (3).$$

And solve (2) and (3).

SOLUTIONS TO LAST MONTH'S EXAMPLES.

1.
$$\frac{x^6 + x^5 - x^4 - x}{x^6 - 1} = \frac{x^4(x^2 - 1) + x(x^4 - 1)}{(x^2 - 1)(x^4 + x^2 + 1)}$$

$$= \frac{x^4(x^2 - 1) + x(x^2 + 1)(x^2 - 1)}{(x^2 - 1)(x^4 + x^2 + 1)}$$

$$= \frac{x^4 + x(x^2 + 1)}{x^4 + x^2 + 1}$$

$$= \frac{x(x^3 + x^2 + 1)}{x^4 + x^2 + 1}.$$

2.
$$x + y = 4 \quad (1)$$

$$(a + b)x + (a - b)y = 4a \quad (2).$$

Multiplying (1) by $a - b$ and subtracting, we get

$$(a - b)x - (a + b)x = 4(a - b) - 4a,$$

or $2bx = 4b$.

$$\therefore\ x = 2,$$

and $x + y = 4$.

$$\therefore\ y = 2.$$

2. Let x yards = length of side of field before the making of the path, and hence area = x^2 sq. yds.

Then after the making of path

length of side = $x - 4$ yards, and hence area = $(x - 4)^2$ sq. yds.

$\therefore$ area of path = $x^2 - (x - 4)^2 = 4x - 4$.

But area of path = $\frac{1}{10}$ that of original field.

$$\therefore\ 8x - 16 = \tfrac{1}{10}x^2,$$

$$x^2 - 160x + 320 = 0.$$

$$x = \frac{160 \pm \sqrt{25600 - 1280}}{2}$$

$$= \frac{160 \pm 2\sqrt{6080}}{2}$$

$$= 80 \pm \sqrt{6080}$$

$$= 80 \pm 78 \text{ approx.}$$

$$= 2 \text{ or } 158.$$

The answer 2 yds. is inadmissible, as no such path of the width mentioned, viz. 2 yds., could be made in it.

$$\therefore\ x = 158 \text{ yds.}$$

$$\therefore\ x^2 = 25{,}000 \text{ sq. yds. approx.}$$

4. Let $3x$ and $2x$ feet be the length and breadth of the room respectively.

Then area = $6x^2$ sq. ft.

If the lengths become $3x + 3$ and $2x + 3$ feet

$$\text{area} = (3x + 3)(2x + 3)$$

$$\therefore\ \frac{(3x + 3)(2x + 3)}{6x^2} = \frac{35}{27},$$

$$\therefore\ 27(3x + 3)(2x + 3) = 6 \times 35x^2,$$

$$\therefore\ 9(6x^2 + 15x + 9) = 70x^2,$$

$$\therefore\ 16x^2 - 135x - 81 = 0,$$

$$\therefore\ (16x + 9)(x - 9) = 0,$$

$$\text{giving } x = \frac{-9}{16}, \text{ or } +9,$$

of which answer the negative one is inadmissible.

$$\therefore\ x = 9,$$

$\therefore$ length = $3x = 27$ feet,

breadth = $2x = 18$ feet.

MECHANICS COURSE.

Loney, Chapter IV., should be read and a few of the examples at the end, say 5 to 10 inclusive, may be worked. The Hydrostatics is to be continued by the reading of Chapter XX., in which plenty of examples should be done, say all the odd numbers. At the same time miscellaneous examples should be worked.

Illustrative examples:

(1) A boat of mass 100 tons is urged forward by its engines with a force of 10 tons, and moves with an acceleration of 1 ft.-secs.^{2} Find the resistance of the water.

Let R tons be the water resistance.

So that force causing the motion is

(10 — R) tons = 2240 × 32 (10 — R) poundals.

By equation $P = mf$ we get

$$2240 \times 32(10 - R) = 100 \times 2240 \times 1,$$

$$\therefore\ 10 - R = \frac{100}{32} = 3\tfrac{1}{8}.$$

$$\therefore\ R = 6\tfrac{7}{8} \text{ tons.}$$

(2) What would be the acceleration in the previous question if the water gave no resistance?

$$P = mf,$$

$$10 \times 2240 \times 32 = 100 \times 2240f,$$

$$\therefore\ f = 3{\cdot}2 \text{ ft.-sec.}^2.$$

(3) A body weighs 10 lbs. in air, and 4 lbs. in water, what is its sp. gr.?

Here the body weighs 6 lbs. less in water than in air.

$\therefore$ weight of water displaced = 6 lbs.

But the body being entirely immersed this means that weight of an equal volume of water = 6 lbs.

$$\therefore \text{ sp. gr.} = \tfrac{10}{6} = 1\tfrac{2}{3}.$$

Note following rule:

$$\text{Sp. gr.} = \frac{\text{Weight of body in air}}{(\text{Weight in air}) - (\text{weight in water})}.$$

(4) A body of sp. gr. 3 weighs 10 lbs. in air, what is its weight in water?

Using the rule at end of (3) we get

$$3 = \frac{10}{10 - w}, \text{ where } w = \text{weight in water,}$$

leading to $w = 6\frac{2}{3}$ lbs.

(5) A body of mass 9 lbs. weighs 6 lbs. in water and 7 lbs. in oil, what is the sp. gr. of the oil?

Here weight of water displaced by body = 9 — 6 = 3 lbs.
and ,, oil ,, ,, = 9 — 7 = 2 lbs.
and as the volumes of oil and water displaced are the same, the sp. gr. of the oil = $\frac{2}{3}$ = ·6.

CHEMISTRY COURSE.

This month, nitric acid and the oxides of nitrogen may be studied. Note the similarities and differences between N_2O and O; note that NH_4NO_3 when heated gives rise to N_2O and H_2O, and that NH_4NO_2 gives rise to H_2O and N.

OUR L.L.A. COURSE.

HONOURS EDUCATION.

BY THOS. CARTWRIGHT, B.A., B.SC. (LOND.)
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QUICK'S 'EDUCATIONAL REFORMERS,' CHAPS. X.—XIV.

I.—*Digest.*

(*a*) **Comenius, 1592—1671.** The life as told on pp. 119–134 should be epitomised. The main points are (1) late acquaintance (16 years of age) with Latin and thoughts as to a better method; (2) **Janua,** and consequent world-wide celebrity; (3) invitation to England; (4) connection with De Geer and consequent six years' slavery at a new method of teaching Latin; (5) his Protestantism and the exile that followed, as well as the bigotry against Catholics and its effects upon his career; (6) the sacking of Leszna, the loss of his manuscripts, and his connection with the younger De Geer, whereby the folio edition of his works on education was published in 1657.

Knowledge of the life of Comenius is infinitely less important than a complete grasp of his doctrines.

Education is mind development, and requires a knowledge of the laws of mind (Cp. Spencer). Working in accordance with these laws is what is meant by '**follow Nature.**' '*Nature has planted within us the seeds of* **learning, virtue,** and **piety.** *To bring these seeds to maturity is the object of education* (Cp. Locke's **Virtue, Wisdom, Manners, Learning**).

Nature chooses the fit time. Prepares the material beforehand. Begins with the inmost part. The crude form first, then the elaboration. There are no leaps or gaps in her method, but it is a steady, continuous process of development, beginning with the cradle and ending with the grave. Nature protects her work from injurious influences.

Order of development of faculty.—First educate the **senses,** then the **memory,** then the **intellect,** and last of all the **critical faculty.** Great stress is laid upon sense training. **Everything in the intellect must have come through the senses** (Nihil est in intellectu quod non prius fuerit in sensu). **Learning to be made pleasurable.** (1) Parents to praise learning; (2) teacher to be kind and fatherly; (3) school to be pleasant, healthy, and well equipped; (4) curriculum to be well within the children's powers; (5) method to be natural; (6) examinations to be held and merit to be rewarded. **Punishment to be given only for offences against morals.** From the above it follows that the wretched divorce of words from things (infelix divortium rerum et verborum) is to be avoided. **Things, ideas, words,** is to be the order of acquisition.

The mother tongue to be the only language from 8 to 10. Language to be learnt by conversation, grammar coming last and not first. **"Rules assist and confirm practice, but they must come after, not before it."**

FOUR KINDS OF SCHOOLS.—(1) **School of Infancy,** the mother being the teacher up to the age of 6; (2) **Vernacular School,** *i.e.* the primary school for children from 6 to 12 years of age; (3) **Latin School** or gymnasium; (4) **the University.**

PRIMARY SCHOOL CURRICULUM.—(1) **The three R's**; (2) **Composition** (with grammar); (3) **Actual weighing and measuring** of objects; (4) **singing** from ear and by sight; (5) **Religion,** including the memorising of Psalms, hymns, texts; catechism, Bible history; (6) **Moral Rules** and examples; (7) **Domestic** and **Political Economy**; (8) **History** (general of the world); (9) **Geography**—mathematical, physical, and political—of the native land; (10) **General knowledge of arts and handicrafts.**

In the '**School of Infancy**' the child is to be given simple lessons in objects, taught to know stones, plants, and animals; the names and uses of the members of his body; to distinguish light and darkness and colours; the geography of the cradle, the room, the farm, the street and the field, trained in moderation, purity, and obedience, and taught to say the Lord's Prayer. The suggestions in the direction of Pestalozzi and Froebel in the book written for this course by Comenius are many and striking. These four grades of schools cover the whole field of education. Further, **education is for all,** the right of women to education being especially insisted upon. 'Not only are the children of the rich and noble to be drawn to the school, but all alike, gentle and simple, rich and poor, boys and girls, in great towns and small down to the country villages.'

Real *realism, knowledge derived at first hand through the senses.* "To exercise the senses well about the right perceiving the differences of things will be to lay the grounds for all wisdom, and all wise discourse, and all discreet actions in one's course of life; which, because it is commonly neglected in schools, and the things that are to be learned are offered to scholars without their being understood, or being rightly presented to the senses, it cometh to pass that the work of teaching and learning goeth heavily onward and affordeth little benefit.' Quick's caution is needed, 'We must not demand that the education of the future should care for the senses only.' Moreover, there are many who believe that athletics are being overdone.

To *Discentem oportet credere* (A learner must believe) and *Ipse dixit* (The Master has said it) Comenius (with Locke) would oppose *Nullius addictus jurare in verba magistri* (In no degree inclined to swear to the words of the master), *i.e.*, not inclined to believe and ask no questions. All educationists are opposed to this passive reception without thought and without understanding. It is really what Montaigne meant by his 'Sçavoir par cœur n'est pas sçavoir,' and is instinct in the exclamation, 'Out on you, idle words!'

He accepted only in a half-hearted way the products of the genius of past ages.

BOOKS ON EDUCATION.—(1) **The Great Didactic.** This was the great educational work of Comenius, wherein he discusses the science and art of education, the curriculum, the different grades of schools. The scope of the work may be judged from the following sectional headings taken from Prof. Laurie's 'Comenius':—FIRST SECTION—**Pansophy and the Aim of Education.** It was Comenius's ambition to found a College giving opportunities for the universal study of the whole body of science might be afforded. To this universal and systematised learning he gave the name of **Pansophia** or Encyclopaedia. It will be be remembered that the 'Prodromus,' published by Hartlib, was simply the preface to this first section of 'The Great Didactic.' The full title was, 'A Prelude of Pansophy, in which the necessity of universal wisdom, its possibility, and its practicability (if it be approached according to a certain method), is briefly and clearly demonstrated.' SECOND SECTION—**The Method of Education.** THIRD SECTION—**The Art of Education,** *i.e.*, **the Application of Method to Practice.** FOURTH SECTION—**On the General Organisation of a School System.** Herein is set out the fourfold scheme above given.

(2.) **Books on the Teaching of Latin.**—(*a*) The **Vestibulum** (The Vestibule); (*b*) The **Janua** (The Gate)—an illustrated edition of this, the **Orbis Pictus,** is famous as the **first illustrated school book**; (*c*) **The Atrium** (The Hall). These were the books designed by Comenius to replace the classics which he regarded as unsuitable reading for the young, and also for Christians of any age.

(3.) **The School of Infancy.**—This is a treatise upon the education of the child up to the age of six years. The book can be got from Isbister's, and will well repay careful study. The student is advised to get the book, and to carefully read it through.

(*b*) **The Port-Royalists or the Jansenists,** called Port-Royalists from the Cistercian Convent near Versailles, over which the Mère Angélique, granddaughter of Antoine Arnauld, presided. Called Jansenists after Jansen, Bishop of Ypres in Belgium. Hauranne, or Saint Cyran, as he was called after his abbey, had been a fellow student with Jansen, and it was through Saint Cyran that Jansen became connected with the little band of Evangelists.

Angélique was compelled by sickness to bring her community to Paris, and here they were ministered to by Saint Cyran, who greatly influenced them, and became the ruling spirit of the Port-Royalists or Jansenists.

The Little Schools were small in size and limited in curriculum, therefore could in no way enter into rivalry with the University of Paris, as did the Jesuits. Thus it came about that there was no enmity between the University and the Little Schools, which indeed greatly influenced for good the University, as may be seen from **Rollin's Traité des Études,** a work that was wholly influenced by the Port-Royalists, and which has greatly influenced the fortunes of education in France.

No forcing was to be attempted.

More **individual care and watching** than they can possibly get in a public school. The question of public versus private education again crops up here. Quick's footnote puts the matter very fairly. A large public school shows a good average of unpolluted boys, with an irreducible minimum of corrupted ones. This would probably be the case under Locke's suggested private tuition; for if the Jansenists were not right in restricting salvation hereafter to a chosen minimum, it is inevitable that every flock shall have one or more black sheep, which does not say much for the boasted 'beautiful economy of nature.'

A high value is set upon teaching, and much is required of the teacher. 'There is no occupation in the Church that is more worthy of a Christian; next to giving up one's life, there is no greater charity.'

All was to depend upon the **influence** of those in charge of the scholars, hence the care taken in choosing both masters and servants, and the incessant watchfulness in keeping off evil influences. 'In guarding the citadel, we fail if we leave open a single gateway by which the enemy might enter.'

Study to be **pleasurable, rivalry** to be **excluded**; the only rival to be outstripped being one's own higher self—a very laudable doctrine. The object **piety rather than knowledge,** hence no pressure.

The **vernacular** was first used in reading, and **translations** of the classics were put into the hands of the pupils; thus, as Quick says, **both the mother tongue and literature were brought into the schoolroom.**

In studying Latin the **difficulties were lessened as much as possible.** This is well expressed in Quintilian's aphorism, 'To me it will be among the grammarian's good points not to know everything.' Latin translation into French also superseded the theme, *i.e.* writing in Latin.

The claims of reason were championed. 'It is a heavy bondage to think oneself forced to agree in everything with Aristotle.'

Little heed was given to bodily training.

BOOKS.—1. **Arnauld's 'Règlement des Études.'** Competition and prizes were admitted. The mother tongue was exalted, and boys were recommended to repeat to each other the substance of what they had learnt.

2. **Nicole's 'Vues générales pour bien élever un prince.'** 'Properly speaking, it is not the masters, it is no instruction from without, that makes things understood; at the best the masters do nothing but expose the things to the interior light of the mind, by which alone they can be understood.' This shows how necessary it is to study the disposition of the scholar, and to adjust our methods thereto.

'In children the light depends greatly on their senses; we should as far as possible attach to the senses the instruction we give them, and make it enter not only by the ears, but also by the sight, as there is no sense which makes so lively an impression on the mind and forms such sharp and clear ideas.' This is sound, and in perfect agreement with Comenius and the realists.

For moral training, **goodness**; for intellectual training, **intelligence.** These are the qualities necessary to a good teacher.

The true results of education cannot be tested by examinations.

3. **Rollin's 'Traité des Études.'** Study depends on the will. Compare Locke's 'Nil Minerva invitâ.' This is not easy to work in accordance with, for 'among a very great number of masters, who in other respects are highly meritorious, there will be found very few who manage to get their pupils to like their work.

'They (the Port Royalists) it was who protested against the dismal grind of learning to read first in an unknown tongue, and of studying the rules of Latin in Latin with no knowledge of Latin, a course which professed to lead, as Sainte-Beuve puts it, to the unknown through the unintelligible. They showed that ordinary difficulties were due not to the dulness of the learners, but to the stupidity of the masters. They showed how much might be done to remove these difficulties by following not routine but the dictates of thought and study and love of the little ones.'

John Brinsley, in his 'Ludus Literarius, or the Grammar Schoole,' shows what is done in language teaching, criticises this, and suggests improvements.

Hoole translated the 'Orbis Pictus.' He aptly describes Comenius's good way of dealing with early education, and condemns the practice of his day, which did proceed 'first to exercise the senses well by presenting objects to them, and then to fasten upon the intellect by impressing the first notions of things upon it, and linking them one to another by a rational discourse.'

'Do not clog their memories with bare grammar rudiments . . . because indeed they signify nothing to them but a mere swimming notion of a general term, which they know not what it meaneth till they comprehend all particulars.' Understanding is to be kindled by the use of the vernacular and objects and pictures; further, 'it is the very basis of our profession' to study mind in order to conform to the laws of mind in tuition, *i.e.* the teacher must learn some psychology.

Dury's 'Reformed Schoole' (published 1649). Education pleasurable. Advancement in piety. Preservation of health. Manners. Learning. Dury was a consistent follower of Comenius, as the following shows:—

'As in nature sense is the servant of imagination; imagination of memory; memory of reason: so in teaching arts and sciences we must set these faculties a-work in this order towards their proper objects in everything which is to be taught. Whence this will follow, that as the faculties of man's soul naturally perfect each other by their mutual subordination, so the arts which perfect those faculties should be gradually suggested, and the objects wherewith the faculties are to be conversant according to the rules of art should be offered in the order which is answerable to their proper ends and uses, and not otherwise.'

Again note the three sources of knowledge: (1) **Sense**; (2) **Tradition**; (3) **Reason,** *i.e.* we have knowledge through the senses, which we amplify and perfect by reflection, and lastly, we get knowledge by word of mouth.

Petty.—'We wish therefore that the educands (scholars) be taught to observe and remember all sensible objects and actions, whether they be natural or artificial, which the educators must upon all occasions expound unto them.' Thus a study of the 'realities' is to precede a study of literature, *i.e.* things are to be studied in place of 'a rattle of words.' Things delight, words distress. The business of education is to be studied and practised by the best and abler persons.' 'All children, though of the highest rank, are to be taught some gentle manufacture in their minority.' Education is to be universal, so that it may not come to pass that 'many who are now holding the plough might have been made fit to steer the State.' Physical education to be attended to.

Milton's 'Tractate on Education' advocates verbal 'realism,' and 'though a linguist should pride himself to have all the tongues that Babel cleft the world into, yet, if he has not studied the solid things in them as well as the words and lexicons, he were nothing so much to be esteemed a learned man as any yeoman or tradesman competently wise in his mother dialect only.' Moral glow and intense hatred of verbalism are the chief features of the 'Tractate.' His method of teaching languages not commendable. Knowledge about things is to be got from books. The 'Tractate' is found, with many weaknesses, to be strong in this, that it co-ordinates physical, moral, mental, and æsthetic training.

Locke.—Concerning Locke, all that need be said was said in connection with the sections on the 'Thoughts.' The student will again study the 'Thoughts' in connection with Quick's chapter.

II.—*Notes and Criticism.*

It is impossible to overrate the importance of Comenius as an educational reformer. As Compayré says: 'The methods which we should be tempted to consider as wholly recent, his imagination had already suggested to him. . . . But what is of more consequence with Comenius than a few happy discoveries in practical pedagogy, is the general inspiration of his work. He gives to education **a psychological basis** in demanding that the faculties shall be developed in their natural order; first the senses, the memory, the imagination, and lastly the judgment and the reason. He is mindful of physical exercises, of technical and practical instruction, without forgetting that in the primary schools, which he calls 'studios of humanity,' there must be trained not only strong and skilful artisans, but virtuous and religious men, imbued with the principles of order and justice. . . . 'The child,' he says, 'shall learn only what is to be useful to him in this life or the other.' Finally, he does not allow himself to be absorbed in the minute details of school management. He has higher views—he is working for the regeneration of humanity. Like Leibnitz, he would freely say, 'Give me for a few years the direction of education, and I agree to transform the world.'

With respect to his four grades of schools, the 'Cyclopædia of Education' says:—'The experience of three centuries has sanctioned and established the school classification of Comenius, whose intention it was that in the intermediate schools the instruction should be so balanced and so symmetrically administered, that any pupil on leaving them might carry with him such a general education as befitted his fortunes or his future destination. "We pursue," says Comenius, "a general education—the teaching to all men of all the subjects of human concern." And again, "The purpose of the common people's school shall be that all children of both sexes, from the 10th to the 12th or 13th year, may be instructed in that knowledge which is useful during the whole of life." It was the ordinance of Comenius that **"there should be a natural school in each family, an elementary school in each district, a gymnasium in each city, an academy in each kingdom or even in each considerable province."**'

The following account of the celebration of the two hundredth anniversary of the Reformer, taken from Monroe's 'Introduction to the Schools of Infancy,' will be very interesting to our readers:—'On the 28th of March 1892, educators the world over met to honour his memory and reflect upon the vast significance of his life and teachings. At the same time, there was erected at **Naarden, in Holland,** a modest but appropriate monument. It stands in a little park that is tastefully ornamented with shrubs and flowers, and consists of a little pyramid of rough stones, with two marble slabs containing beautiful gold-furrowed inscriptions in Latin, Dutch, and Slavonic. Here, in this quiet little Dutch town, where he passed his closing days in exile, hundreds of educators come annually from Germany, Austria, Bohemia, Poland, Sweden, and other European countries to pay willing homage to the memory of a great teacher and a good man.'

Jesuits and Jansenists.—'The Jesuits had substituted for the old monastic *régime* of incessant punishment—mainly corporal—an elaborate system of rewards. Appeal to the spirit of emulation was, in fact, a leading principle of the Jesuit schoolmaster. The Port-Royalists, on the other hand, thought of this spirit as a relic of the old Adam. A striking sentence in Pascal's "Pensées" shows us how alive he was at once to the beauty of the Port Royal theory and to the danger in its practice:—"L'administration gâte tout dès l'enfance. Oh, que cela est bien dit! qu'il a bien fait! qu'il est sage! Les enfants de Port Royal, auxquels on ne donne point cet aiguillon d'envie et de gloire, tombent dans la nonchalance."' *Discipline supported by little punishment and no rewards*—this seeming like a counsel of perfection. . . . Yet even more interesting than the discipline is the instruction of these teachers. Like the Jesuits, they treated the Humanities as at once the root and flower of their education. But there was **an immense difference** in the methods pursued. The Jesuits taught the classical languages mainly through books of extracts; the Port Royalists preferred to read the authors themselves, or at least large portions of them. The phrase-books which had been introduced by the Jesuits to help their scholars, while struggling with the difficulties of composition, were disliked by the Port Royalists. For again, while the Jesuits cultivated composition at the expense of translation, the Port Royalists argued that familiarity with the languages themselves should precede the attempt to compose in them. Consistently with this, they recognised that while Latin verse-making might be a useful and refining study for a limited number of pupils, there must also be a considerable number quite unequal to the task—in this again unlike the Jesuits. These, again, used grammars written in Latin, while the Port-Royalists introduced grammars written in French. With the Jesuits, once more, *form* or *style* was the first and almost the sole consideration; whereas the Port Royalists argued that '**the utility of things should be joined to that of words, in order to form the judgment of the young while the memory is stocked, and even to ease the memory by putting the words to things, which always make a greater impression on the mind.**' In brief, while other educators were putting words before things, the Port Royalists were putting **things before words**' (Cyclopædia of Education).

But it is rather in the methods of teaching, and in the administration of classical studies, that we must look for the incontestable superiority of the Jansenists. The teachers of the Little Schools were admirable **humanists, not of form,** as the Jesuits were, but of judgment. They represent, it seems to us, in all its beauty and in all its force, that intellectual education, already divined by Montaigne, which prepares for life men of sound judgment and of upright conscience. They founded the teaching of the humanities. 'Port Royal,' says an historian of pedagogy (Burnier), 'simplifies study, without, however, relieving it of its wholesome difficulties; it strives to make it interesting, while it does not convert it into child's play; it purposes to confide to the memory **only what has first been apprehended by the intelligence**. It has given to the world ideas that it has not again let go, and fruitful principles from which we have but to draw their logical consequences.'

III.—*Questions.*

1. Describe the procedure of the Port Royalists in their schools. (1892.)
2. State what you know of Brinsley, Hoole, Dury, Milton, and their educational theories. (1892, 1893.)
3. State the different points in which the method of the Port Royalists differed from that of the Jesuits. (1895.)
4. Give an account of the subjects and the methods of teaching followed by the Port Royalists. (1896.)

No questions as yet have been set for the Honours Examination on Quick's Reformers on either Locke or Comenius. It is easy to understand why Locke should be omitted in the general section, because he has a special section all to himself. This does not apply to Comenius, except that he is one of the special authors for the Pass Examination. Still, as many, if not most, of those who take the Honours have not taken the Pass, and as amongst those who have taken the Pass some would not have read this particular author, there is no good reason why questions on Comenius should not be set, especially as he is one of the arch-reformers of education. We therefore set a few questions on this portion of the book, and we shall not be surprised to find the L.L.A. examiners doing the same thing next June.

Questions on Comenius.

5. Give the main facts in the life of Comenius.
6. Write an account of the more striking reforms advocated by Comenius.
7. Name the chief educational works of Comenius, giving some account of their purport.
8. In what way was Comenius connected with (1) Bacon, (2) Hartlib, (3) Milton.

Students are recommended to get '**Mental Science and Logic for Teachers**' written by the author of these articles, and published by Messrs. Nelson & Sons at 2s. 6d. They will find in this book all that is needed to make them understand the references to the development of faculty and other psychological points upon which the student is likely to be weak.

Students sending in work will save a post by writing direct to Mr. Cartwright, 31, Park Hall Road, E. Finchley, London, N.

QUERY COLUMN.

RULES.

1. **Each correspondent is restricted to *one* question.**
2. **Each query must be accompanied by the *coupon* which appears on the back wrapper of the current number of the Journal.**
3. **CORRESPONDENTS MUST IN ALL CASES STATE THE SOURCE FROM WHICH THEIR QUERY HAS BEEN OBTAINED.**

The Editor reserves to himself the right to decline to answer any question which is, in his judgment, unsuited to the Magazine.

Me.—A piece of work can be done by A alone in 6 hours, by B alone in 5 hours, and by C alone in $4\frac{1}{2}$ hours. They all begin it together, but A alone continues to work until it is finished, B leaving off 2 hours 10 minutes, and C $1\frac{1}{2}$ hours before its completion. In what time is the work accomplished? (Pendlebury, p. 267).

A, B, C do respectively $\frac{1}{6}$, $\frac{1}{5}$, $\frac{2}{9}$ of the whole work each hour.

Let the time be x hours; then A works x hours and does $\frac{x}{6}$ of the work; B works $x-2\frac{1}{6}$ hours and does $\frac{x-2\frac{1}{6}}{5}$ of the work; C works $x-1\frac{1}{2}$ hours and does $\frac{(x-1\frac{1}{2})2}{9}$ of the work.

Hence

$$\frac{x}{6}+\frac{x-2\frac{1}{6}}{5}+\frac{(x-1\frac{1}{2})2}{9}=1.$$

$$15x+18x-39+20x+30=90.$$

$$53x=159.$$

$$x=3 \text{ hours.}$$

A publisher when he sells a certain book at 13 copies for the price of a dozen, gains £7 1s. 8d. on 100 copies, but when he sells it at 25 copies for the price of 24, gains $10\frac{70}{383}$ per cent. on the cost. Find the cost and selling price of each copy.

Let x = selling price per copy.

,, y = cost price.

100 copies are sold for $\left(\frac{100}{13}\right)12x$; they cost $100y$, therefore the gain is $\frac{1200x}{13}-100y$, hence

$$\frac{1200x}{13}-100y=7\tfrac{1}{12} \quad . \quad . \quad . \quad . \quad . \quad . \quad (1)$$

Again, 100 copies are sold for $\left(\frac{100}{25}\right)24x$; they cost $100y$, therefore the gain is $96x-100y$, hence

$$96x-100y=\frac{10\frac{70}{383}}{100} \text{ of } 100y \quad . \quad . \quad . \quad (2)$$

(1) and (2) reduce to

$$2880x - 3120y = 221 \quad . \quad . \quad . \quad . \quad (3)$$

and $96(28\cdot3)x - 3120y = 0 \quad . \quad . \quad . \quad . \quad (4)$

Subtracting, $163\cdot2x = 221.$

$$x = £1\ 7s.\ 1d.$$

From (4) $$y = £1\ 3s.\ 7d.$$

Tim.—The area of any spherical triangle $= (A + B + C - \pi)r^2$. In our example $C = 90°$ and $A = B$, and the area $= \frac{1}{10} \cdot 4\pi r^2$; therefore we have

$$\left(2A + \frac{\pi}{2} - \pi\right)r^2 = \frac{1}{10} \cdot 4\pi r^2.$$

$$\therefore\ 2A = \frac{4\pi}{10} + \frac{\pi}{2} = \frac{9\pi}{10}.$$

$$\therefore\ A = \frac{9\pi}{20} \text{ or } 81°.$$

In *any* spherical triangle

$$\cos a = \frac{\cos A + \cos B \cdot \cos C}{\sin B \cdot \sin C},$$

putting $A = B = 81°$, and $C = 90°$, we have

$$\cos a = \frac{\cos 81°}{\sin 81°} = \cot 81° = \cdot1583844.$$

$$\therefore\ a = 80°\ 53'\ 12\cdot7,$$

by using the tables.

Constant Reader.—Find the conditions that the expressions $lx^2 + mxy + ny^2$, $l^1x^2 + mxy + n^1y^2$ may have a common linear factor. (Hall & Knight, p. 96.)

Take the expression $6x^2 + 19xy + 15y^2$; its factors are $(2x + 3y)(3x + 5y)$. Observe that we may also write $(x + \frac{3}{2}y)(6x + 10y)$, that is, we can always arrange to have one factor of the form $x + ay$.

Now let this be the common factor of the two given expressions, and actually divide it into each of these. Into the first it goes $lx + (m - al)y$ with a remainder $a^2l - am + n$, and therefore into the second it goes $l^1x + (m^1 - al^1)y$, with a remainder $a^2l^1 - am^1 + n^1$. But each remainder must be zero if $x + ay$ is a factor, hence we may write

$$a^2l - am + n = 0$$
$$a^2l^1 - am^1 + n^1 = 0.$$

Solve for a^2 and a as in Art. 128, or in any other way, and you will obtain

$$a^2 = \frac{m^1n - mn^1}{l^1m - lm^1}, \quad a = \frac{l^1n - ln^1}{l^1m - lm^1},$$

from which it follows that

$$\frac{m^1n - mn^1}{l^1m - lm^1} = \left(\frac{l^1n - ln^1}{l^1m - lm^1}\right)^2$$

or $(l^1m - lm^1)(m^1n - mn^1) = (l^1n - ln^1)^2$.

Annie.—A person sells an estate worth £1,200 per annum for 25 years' purchase, and after deducting $1\frac{1}{2}$ p.c. for expenses, invests the remainder in N.E. consols at 155; allowing 2s. 6d. per cent. for brokerage, how much stock did he buy? If the consols pay 7 p.c., what will be the difference in his income supposing the management of the estate cost 10 p.c. of rental?

(Locke's Arithmetic, CXXXVI. 44.)

The first statement tells us that the rent is £1200 ÷ 25 or £48 per annum, which after deducting $\frac{1}{10}$ of 48 for management leaves an income of $48 - 4\cdot8$, or £43·2.

But he sells for £1,200, and deducting $1\frac{1}{2}$ per cent. this leaves $\frac{98\frac{1}{2}}{100}$ of 1200, or £1,182 for investment. This he takes to a broker, who charges 11·82 half-crowns or £1·4775, thus leaving £1180·5225 for actual investment. For each £155 out of this he draws £7 per annum, that is, his income is

$$\frac{1180\cdot5225}{155} \times 7;$$

this gives £53·3139. Hence the difference in his income is an increase of £10·6861, or £10 2s. 3·36d. more.

Tim.—If D be the middle point of AB, show that $\cos AC + \cos BC = 2 \cos \frac{1}{2} AB = \cos CD$. (Todhunter's 'Spher. Trig.,' p. 30.)

Taking first the triangle ACD, and putting d for b in the middle one of the three fundamental formulæ at the bottom of p. 18, we obtain

$\text{Cos } d = \cos AD \cdot \cos CD + \sin AD \cdot \sin CD \cos D$, (1)

where d is AC, and D is ADC.

Again, taking the triangle CBD and putting d for a we get, similarly,

$\text{Cos } d = \cos CD \cdot \cos BD + \sin CD \cdot \sin BD \cos D$, (2)

where d is now put for BC and D for BDC.

Adding (1) and (2) we obtain

$$\cos AC + \cos BC = 2 \cos \tfrac{1}{2} AB \cdot \cos CD,$$

for AD = BD, and cos D in (2) is equal to − cos D in (1).

Joco.—A train starts from a station at 6 o'clock a.m., travelling at the rate of 30 miles an hour; a quarter of an hour later another train starts from the same station, travelling at the rate of $37\frac{1}{2}$ miles an hour. At what o'clock will the latter overtake the former?

(Government Exam.)

The first train gets a start of $\frac{1}{4}$ of 30, or $7\frac{1}{2}$ miles. Since the second train gains on the first at the rate of $37\frac{1}{2} - 30$, or $7\frac{1}{2}$ miles an hour, it will just take 1 hour to get up with the first train; this will be $1\frac{1}{4}$ hours after the first train starts, that is, 7.15 a.m.

Tim.—If $\alpha + \beta + \gamma = \frac{\pi}{4}$, prove that

$$\frac{(1 + \tan\alpha)(1 + \tan\beta)(1 + \tan\gamma)}{1 + \tan\alpha \cdot \tan\beta \cdot \tan\gamma} = 2.$$

(2nd Arts, R.U.I.)

Multipling out, and putting t_1, t_2, t_3 for $\tan\alpha$, $\tan\beta$, and $\tan\gamma$ respectively, we have to show that

$$\frac{1 + (t_1 + t_2 + t_3) + (t_1t_2 + t_2t_3 + t_1t_3) + t_1t_2t_3}{1 + t_1t_2t_3} = 2,$$

or that

$$1 + \frac{(t_1 + t_2 + t_3) + (t_1t_2 + t_2t_3 + t_3t_1)}{1 + t_1t_2t_3} = 2,$$

or that

$$\frac{(t_1 + t_2 + t_3) + (t_1t_2 + t_2t_3 + t_3t_1)}{1 + t_1t_2t_3} = 1. \quad (1)$$

Now, by making use of the formula for $\tan(\alpha + \beta)$, it is easy to show that

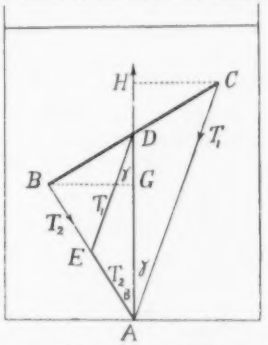
$$\tan(\alpha + \beta + \gamma) = \frac{(t_1 + t_2 + t_3) - t_1t_2t_3}{1 - (t_1t_2 + t_1t_3 + t_2t_3)} \quad (2)$$

Since $\alpha + \beta + \gamma = \frac{\pi}{4}$, the right-hand side of (2) is equal to 1, and is therefore a fraction which is not altered in value by adding the same quantity to numerator and denominator. But the left-hand side of (1) is easily obtained from the right-hand side of (2) by adding to the numerator and denominator the quantity $t_1t_2t_3 + (t_1t_2 + t_2t_3 + t_3t_1)$, hence the left-hand side of (1) is equal to 1.

Utopia.—BC is a rod of uniform density lighter than water; it is held under water by two threads, AB, AC, fastened to a fixed point A, at the bottom of the tank which contains the water; show that the tensions of the thread are in the same ratio as their lengths.

(S. and A. Dept., 1894.)

The forces which keep the rod at rest are (1) its weight, (2) an upward force equal to the weight of water which rod displaces, (3) tension in AB, (4) tension in AC. The first two have a *vertical* resultant R passing through D, the middle point of the rod; it must also pass through A, the intersection of the lines of action of the remaining two tensions,



otherwise there would not be equilibrium. Since R, T_1, T_2 are in equilibrium they will be proportional to DA, DE, EA, drawn parallel to them.

Hence we have

$$\frac{T_1}{T_2} = \frac{DE}{EA} = \frac{\sin DAE}{\sin EDA} = \frac{\sin\beta}{\sin\gamma}.$$

If BG and CH are drawn perpendicular to AD, they will be equal, since BD and DC are equal.

Then $$\frac{\sin\beta}{\sin\gamma} = \frac{BG}{AB} \div \frac{CH}{AC} = \frac{AC}{AB}$$ Q.E.D.

OUR PUPIL TEACHERS' AND SCHOLARSHIP COURSE.

BY ARTHUR T. FLUX,

Head Master of the Belvedere Pupil Teachers' Centre, First on Scholarship List, Author of 'Scholarship School Management.'

PUPIL TEACHERS' COURSE.

AUTUMN EXAMINATION, 1898.

FIFTH MONTH.

WORK TO BE PREPARED.

A.—*English.*

(Students are invited to write for assistance in case of difficulty not taken in the course).

First Year.

1. Finish and revise Latin suffixes.
2. Prepare lines 194–223 of the 'Lay of the Last Minstrel,' with all meanings, allusions, etc.

Second Year.

1. Prepositions—their derivation and functions.
2. Revise all prefixes.
3. Prepare lines 613–658 of the 'Winter Evening,' *Task*, Book IV. Pay special attention to the paraphrase.

Third Year.

1. Learn 20 roots and meanings per week.
2. Prepare lines 441–539 of 'Comus.' Pay special attention to the paraphrase.

Notes.

Line 195. May be taken 'he bent his sinewy frame' or as it stands.
196. *Amain.* Adv. of manner from A. S. Maegen.
197. *Like.* Adverbial conjunction—'like rain falls from a cloud.'
198. *Passing, i.e.* surpassing or wonderful.
199. This line is a noun sentence in apposition with *it* in preceding line.
200. *Would* = wish. Principal verb (*not* Auxiliary) followed by a noun sentence.
To see. Infinitive of Purpose, gov. a noun sentence.
201. *So* = Adv. of Degree mod. *gloriously.*
202. Supply 'how it.'
203. *Far.* Adv. of Deg. mod. *aloof. Aloof* = Adj. of place qual. galleries.
205. *like.* Adv. Conj.—'like heaven's own light shines.'
207. Supply *it* at commencement of line, also as Subject in the two following lines.
211. *As.* Comp. Adv. modifying the Adverbial Sentence following.
Day. Abs. Noun. Obj. Case.—The Adverbial Object (see Text Book).
213. *Some.* Adv. of Degree modifying 'seventy.'
Winters. Adverbial object.
Old. Adjectival completion of the Pred. *seemed.*
222. *All* = Entirely = Adv. modifying 'unruffled.'

'The Task.' General Paraphrase.

613-657. But there is another far-reaching and potent cause which is mainly responsible for this deterioration among the rural population, one which it is, I suppose, somewhat unpatriotic to wish to remove; that is, the drafting of the country labourers into the ranks of the army. The profession of arms, while satisfying the bloodthirsty and brutal instincts of all, seems particularly destructive of morality. When the country yokel, ignorant and simple, accustomed only to such innocent recreations as may be found in wrestling matches, football, racing, or the merriment of a country fair, first hears that he has been selected by ballot to serve in the army, he receives the information with some amount of astonishment and awe. He presents himself shyly and awkwardly, takes off his hat, and in indistinct tones mumbles through the oath, which, though he is ignorant of its purport, places him for a time at the complete disposal of his superiors. He is handed over to the drill sergeant, who forthwith commences a long series of lessons interspersed with jests and oaths at his awkward walk, turned-in toes, round shoulders, bent knees, and woebegone appearance.

Gradually, however, these blemishes are removed, notwithstanding his natural density and dulness. He stands erect, his plodding step becomes an alert military stride, his whole appearance is improved, his hair is dressed with grease and covered with powder, his helmet or hat is worn with a swagger, and, conscious of and pleased at the change, he endeavours to improve still more, so that when at the termination of his service he returns to his native village, he looks with disdain upon the humble occupations he previously shared in, and regrets the loss of his boon companions of the regiment. For with the improvement in outward appearance there is a great deterioration in the whole moral tone of the man. His contented ignorance is replaced by the knowledge of dissolute vices, which he loves to parade. He is a drunkard and gambler, his speech is interlarded with oaths, he is a lazy and indolent rogue, and whereas he once was a useful member of society his chief aim seems now to act so as to break the heart of his mother and ruin the girl who formerly loved and trusted him.

B.—*Arithmetic.*

First Year.

Boys.—Fractions applied to quantities.

Girls.—Addition and Subtraction of Fractions. Prepare diagrams to illustrate and prove the rules.

Second Year.

Boys.—General Problems on Stocks.

Girls.—Fractions applied to weights and measures.

Third Year.

Boys.—General problems.

Girls.—Division into Proportional Parts. Note especially the method followed with fractions.

C.—*Music.*

First Year.—Two, three, and four-pulse measures.
Second Year.—General practice on transitions.
Third Year.—Finish the common musical terms.

D.—*Geography.*

Ireland.—Draw maps for each section of work, insert all places to be remembered, and practise continually till known. The industries and towns, railways, etc., require special attention. Any general reading which assists should be done.

Test Questions on Scotland.

1. Describe the situation and character of the Highlands.
2. Where are Lanark and the Trossachs? Give one or two leading facts about them.
3. Name three important rivers in Scotland, state where they rise, what important towns are on their banks, and what is the commercial importance of these towns.
4. Where are the following and for what noted?—Sumburgh Head; Stornoway, Berwick, Oban, Dundee, Aberdeen, Balmoral, Kyles of Bute, Crinan Canal, St. Andrews, Glenmore, Strathmore, Carse of Gowrie.
5. Explain clearly what is meant by the Hebrides. Make a list of them and give a description of the island of Arran.
6. Name places famous for the birth or residence of great men in the Lowlands.
7. Describe a coasting voyage from Edinburgh to Wick and from Oban to Glasgow.
8. Describe the Mountain and Hill system of Scotland.
9. Write a letter giving an account of a fortnight's holiday in the Western Highlands.
10. What are the chief industries of Scotland, and in what districts and towns are they carried on?
11. Say what you can of the climate of Scotland. What is meant by the statement that 'the isotherms follow the Meridians'?
12. Compare and contrast the Eastern and Western Coasts.
13. Give some account of the fishing industry round the Scotch coasts.
14. What are the chief Railway lines of Scotland?
15. Which are the University towns of Scotland? What do you know of Education in Scotland generally?
16. Name some important battlefields in Scotland, and account, if you can, for the fact that battles were fought there.

E.—*History.*

William I.—Note carefully the results of the Conquest. The Feudal System and all terms connected with it. The subjugation of England, the various revolts against the Norman rule. Read Kingsley's 'Hereward the Wake.'

Note.—Changes produced by the Conquest.

1. New dynasty, or reigning family.
2. New nobility—many of very humble antecedents.
3. Saxon Commoners became villeins, Saxon lands transferred to Normans.
4. England brought into closer contact with the Continent, France especially.
5. Perfection of Feudal System, which had existed before.
6. The Church much improved in learning, etc.—Numerous Cathedrals and Monasteries built. Saxon prelates displaced by Normans.
7. The Saxon laws give way to Norman-French law.
8. The language—Anglo-Saxon spoken by the poorer classes, Norman-French by new nobility—consequent strife for 200 years, resulting in the formation of *English.*
9. Change in dress, manners, and food.
10. The phlegmatic Saxon temperament improved by the infusion of the quicker Norman blood.

F.—*Euclid.*

Second Year.—Props. 17–20, with two deductions per week.
Third Year.—Revise Definitions, Axioms, Postulates, and Props. 1–6, Book I., and work four deductions per week.

G.—*Algebra.*

Complex fractions. Use factors as much as possible.

Remember the signs of the numerator *or* denominator may be changed if the sign preceding the fraction is changed, or signs in both numerator and denominator may be changed without changing sign in front.

H.—*Teaching.*

Second Year.—Chap. V. 'Scholarship School Management.' The Teaching of Spelling and Wordbuilding.

Third Year.—Chap. XIII. 'Scholarship School Management.' Discipline (First half). Meaning of term, exterior circumstances affecting it, etc.

QUESTIONS TO BE ANSWERED.

1. *Penmanship.*

(*a*) Largehand—Negligently, Ornithorhynchus, Parallelogram.

(*b*) Smallhand—

Alas! they had been friends in youth,
But whispering tongues can poison truth.

2. Write an essay each week.

(*a*) The results of the Norman Conquest.
(*b*) Divers and their work.
(*c*) A stitch in time saves nine.
(*d*) A walk in the country.

3. *English.—First Year.*

(1) Analyse Stanza XIV., and parse *him* (152), *to come* (153), *ere evening close, would read, may not be said.*

(2) How do you distinguish Adverbs from Prepositions? Give examples where the same word may be used as both.

(3) Take the following words to pieces, and tell the meaning of each of their parts:—*Homeward, Oaken, Greenish, Friendless, Mirthful, Chicken, Kingdom, Songster, Duckling, Childhood, Forgive.*

Second Year.

(1) Paraphrase 576–586; 595–612.

(2) Analyse 566–575; 578–586; 595–612.

(3) Parse *to invade* (560), *another's* (560), *their own* (560), *to frighten* (564), *farewell* (565), *even* (572), *unconscious once* (573), *full* (576), *luxury excess* (581), *contagious* (584), *themselves* (589), *herself* (593), *in vain* (596), *himself enslaved* (601), *prove* (604), *than becomes* (605), *whoso* (610).

(4) Give the prefix, root, and suffix of the following words:—*unguarded, undisturbed, unsuspicious, unconscious, scrofulous, resident, magisterial, profession, propitious.*

Third Year.

(1) Paraphrase—

(*a*) Be not over-exquisite
. . . . misbecoming plight.
(*b*) Virtue could see . . . .
. . . . dungeon.
(*c*) I do not, brother . . . . You remember not.

(2) Analyse the same passages.

(3) Parse *grant* (361), *what need* (362), *so to seek* (366), *not being in danger* (370), *all to-ruffled* (380), *far* (388), *to save her blossoms* (396), *as well* (398), *rather than* (412).

4. *Arithmetic.—First Year.—Boys.*

(1) Simplify—

$$1\tfrac{1}{4} \times 12\tfrac{1}{2} \text{ of } \tfrac{2}{5} - \frac{6\frac{1}{4} + 7\frac{13}{16}}{12 - 6\frac{3}{4}} - \frac{4 \times \frac{1}{4} \times \frac{1}{4 - \frac{1}{4}}}{4}$$

Ans. 2.

(2) Simplify—

$$1\tfrac{1}{13} \times \frac{\frac{3}{4} + \frac{4}{7}}{\frac{3}{4} - \frac{4}{7}} - \{\tfrac{2}{3} + \tfrac{2}{6} - 2\,(\tfrac{1}{6} - \tfrac{1}{12})\}.$$

Ans. 0.

(3) Simplify—

$$\left\{\frac{11\frac{3}{4} - 10\frac{1}{2}}{11\frac{3}{4} + 10\frac{1}{2}} \div \frac{10\frac{2}{5} + 11\frac{1}{5}}{10\frac{2}{5} - 9\frac{1}{5}}\right\} \frac{\frac{2}{7} + \frac{8}{11}}{\frac{2}{7} - \frac{8}{11}}$$

Ans. $\frac{35}{1331}$.

(4) Simplify—

$$\left[\frac{1}{8} \text{ of } (\tfrac{1}{10} - \tfrac{1}{11}) \div \frac{\frac{1}{7} - \frac{1}{9} \div (\frac{1}{9} + \frac{4}{11})}{(\frac{1}{7} + \frac{1}{9}) \div (\frac{1}{9} - \frac{4}{11})}\right] \times \frac{\frac{1}{3} + \frac{1}{7} \div (\frac{1}{7} - \frac{1}{9})}{(\frac{1}{3} \times \frac{1}{7}) \div \frac{1}{7} - \frac{1}{9}}$$

Ans. 1.

Second Year.—Boys.

(1) What is meant by 'stock'? If $3\frac{1}{2}$ per cent. stock is purchasable at $87\frac{1}{2}$, what annual income can I secure by investing £4,380 16s. 8d. in it after paying $\frac{1}{2}$ per cent. on the purchase money for brokerage? Ans. £174 19s. $8\frac{4}{10}$d.

(2) What sum of money must be invested in the $5\frac{1}{2}$ per cent. stock at 83 to enable the possessor to realise an income of £64 3s. 4d. per calendar month? Ans. £11,620.

(3) If the 3 per cents. are at 93, what interest is obtained for money invested? Ans. $3\frac{3}{4}$ per cent.

(4) Which of the following stocks is most profitable for investment—3 per cents. at $91\frac{1}{2}$, $3\frac{1}{2}$ per cents. at $108\frac{1}{2}$, 4 per cents. at 118? Find the income from investing £5,217 16s. 3d. in the most advantageous of the three.

Ans. 4 p.c. at 118; £176 17s. 6d.

Second Year.—Girls. (As First Year Boys.)

Third Year.—Boys.

(1) If 36 cwt. 3 qrs. 23 lbs. 7 oz. of iron be worth 209 yds. of calico, how many yds. are worth 16 cwt. 3 qrs. 5 lbs. 9 oz. of iron? Ans. 95 yds.

(2) A ship was insured so as to cover the value of the ship and the premium paid. The premium of $4\frac{1}{2}$ per cent. on the amount insured amounted to £1,788 15s. What was the value of the ship? Ans. £37,961 5s.

(3) Reduce 23 cwt. 1 qr. 7 lbs. to the decimal of 36 cwt. 2 qrs. 15 lbs., and find the value of $38\dot{4}3 \times$ £1 0s. $9\frac{1}{2}$d.

Ans. ·63; £4.

(4) Show that division by $\frac{2}{3}$ is equivalent to multiplication by $\frac{3}{2}$, and division by $\frac{3}{5}$ is equivalent to multiplication by $\frac{5}{3}$.

Take the examples—

$$12\text{s.} \div \tfrac{2}{3} = \tfrac{3}{2} \times 12\text{s.}$$
$$15\text{s.} \div \tfrac{3}{5} = \tfrac{5}{3} \times 15\text{s.}$$

Third Year.—Girls.

(1) In a ship a certain number of men receive 63s. a week, five times as many 42s. 6d., and fourteen times as many 17s. 6d. If £182 3s. 6d. be the weekly payment to all, find the number of men. Ans. 140.

(2) Find the value of ·000416 ton + ·0512 of 1 cwt. 13 lbs. — $17\frac{1}{4}$ of 1 qr. 9 lbs.

(3) Divide a profit of £355 among three partners whose capitals are £735, £840, and £910.

Ans. £105; £120; £130.

(4) A cistern holding 800 gallons is filled by 3 pipes in 25 minutes. One pipe discharges 5 gallons more and the other 3 gallons less than the third per minute. How much flows through each per minute? Ans. 10, 15, 7 gallons.

5. *Music.—First Year.*—Name the intervals Te_1 — *fah*, ray_1 — le_1 *me* — *soh*, lah_1 — d^1.

Second Year.—If the first note of each of the following passages is regarded as *me*, what will the others become?

(*a*) t, r fe s l fe l t r fe s
(*b*) l, f ta s d' l ta r d ta, l,

Third Year.—Explain triplet, da capo, larghetto, staccato, cantabile, calando, sforzando.

6. Describe, with a sketch map, the basin of the Clyde.

7. Describe, with a plan, the Battle of Hastings.

8. Give some account of the Saxon laws.

9. What was the Witanagemote—what were its powers?

10. What preparation would you make before giving a reading lesson? What are the chief qualities desirable in a reading book? How would you encourage home reading?

11. Describe some system of drill which would be suitable to junior classes.

12. Write notes of lessons on the following subjects:—A Court of Justice, a Farmhouse, Building a House.

SPRING EXAMINATION, 1898.

ELEVENTH MONTH—MARCH.

WORK TO BE PREPARED.

A.—*English.*

First Year.

Prepare lines 383 to the end, 'Lay of the Last Minstrel,' with all meanings, allusions, etc.

Finish tabulating suffixes in the poem. Revise the meaning of all terms. Prepare a life of Scott, and find out something about his other works in poetry and prose.

Second Year.

Finish the prefixes in the 'Task.'

Revise lines 373 to 600 of the 'Task,' looking over the paraphrases given, carefully. Prepare a life of Cowper.

Third Year.

(1) Learn 20 Roots and meanings per week.

(2) Prepare lines 957 to the end of 'Comus,' with knowledge of all allusions (and they are many).

(3) Prepare a life of Milton, and a short account of his other works. Pay special attention to the paraphrase of the chief passages.

Notes. '*Lay of the Last Minstrel.*'

Line 384. *For* = Illative Conjunction.
389. *Would* = Principal Verb = 'wished.' Object = to pay his vows.
401. *very* = Adj. qual. 'rage.'
404. Adverbial sentence of time to 'pricks.'
406. *As if* = Compound Conjunction.
407. *on high* = Compound Adverb.
408. *to part and fly* = Gerundial Object of 'signs.'
409. *to part and fly* = Infinitives limiting *time*, a common use of the Infinitive.
411. *like* = Adv. Conj. (*i.e.* like the cushat dove flies'.
418. *Full* = Adv. of Degree, mod. 'slyly.'
419. *hand* = Indirect Object gov. by *gave*.
421. *blood* = Noun, Objective case, in apposition with *wine*.
424. Obj. of Prayed = 'God to bless the Duchess long, and all.
426. *To see* = Infinitive of Reason to 'smiled.'

B.—*Arithmetic.*

Revise the theory thoroughly, and work any back problems.

C.—*Music.*

Work any back questions (see below).

D.—*Geography.*

Revise: The British Isles thoroughly. Practise the Memory Maps daily, allowing half an hour only to complete. In revising pay special attention to Production, Industries, and Chief Towns.

E.—*History.*

Revise: From the commencement up to 1066. The chief points have been indicated monthly in the Course. Refer to them especially. Prepare lives of chief men, genealogical tables, illustrative maps of Roman and Saxon England, and the terms connected with this period (such as King, Earl, Thane, Churl, Witan, Frankpledge, Danelagh, Danegeld, Moot, Alderman, Bretwalda, Sheriff, Mund, Were, Wite, etc.).

F.—*Euclid.*

Second Year.—Revise Props. 12 to 20, and work four deductions per week.

Third Year.—Revise any Propositions not thoroughly known, with four deductions per week.

G.—*Algebra.*

Work any back papers (see test below). Revise the Rules in Mensuration.

H.—*Teaching.*

Second Year.—Revise the Teaching of Reading and Writing.

Third Year.—Revise Chaps. 9 to 12 in 'Scholarship School Management.'

(Note what is said about the various subjects in 'Revised Instruction to H.M.I.'s.')

FINAL TEST EXAMINATION.

All Years.

Penmanship (15 *min.* 40 *marks*).

Write as specimen of—

(*a*) Largehand:—Physical Training.

(*b*) Smallhand:—In peace, love tunes the shepherd's reed.

Geography (1 *hour.* 80 *marks*).

(Answer *three* questions, including No. 1).

1. Draw a map (*a*) of Scotland south of the Forth; or (*b*) Ireland west of the Shannon; showing physical features and ten towns.

2. Mention the chief coalfields of Great Britain, and point out briefly how they affect the prosperity of the country.

3. Describe a week's holiday in the western highlands of Scotland.

4. Point out what are the chief articles we export to and receive from Australia and British North America respectively.

5. Describe with a sketch map the basin of the St. Lawrence or the basin of the Murray.

6. Say what you know of South Australia under these heads, (*a*) Productions, (*b*) Chief Towns, (*c*) Government.

History (1 *hour.* 80 *marks*).

(Answer *three* questions, including No. 1 if you can.)

1. Say what you can of the Anglo-Saxons under the following heads:—(*a*) Whence they came; (*b*) Why they came; (*c*) their religion; (*d*) their general character.

2. Why is Agricola said to be the 'real conqueror of Great Britain'?

3. Write 15 or 20 lines on one of the following—
(*a*) The Introduction of Christianity into England.
(*b*) The Feudal System.
(*c*) The Magna Charta.

4. What do you know of four of the following (about five lines each):—Hastings, Severus, Godwin, Edric Streone, Offa, Anselm, De Montfort, Hereward.

5. 'The reign of Edward I. is one of the greatest England has ever seen.' Briefly justify this statement.

6. What do you understand by Interdict, Excommunication, Peter's Pence, and how are these connected with our history?

FIRST YEAR.

English (1 *hour.* 80 *marks*).

(Answer Question 1, and *two* others.)

1. Analyse the following passage, and parse the words in italics:—

For threescore years, in penance spent,
My knees these flinty stones have worn,
Yet all too little to atone
For knowing what should ne'er be known.
Would'st thou thy *every* future year
In ceaseless prayer and penance drie,
Yet wait thy latter end with fear—
Then, daring warrior, follow me!

2. Explain the following clearly:—St. David's Pile, Border Foray, the flying jennet, Notre Dame, the Apostate, A palmer's amice, Velez' scorched wine.

3. Give the force and meaning of the suffixes in the following words:—*ceaseless, warrior, floweret, triumphant, unquenchably, height, noontide, hardihood, elvish.*

4. Tell in your own words the story of the Poem.

5. What do you know of the author of this Poem? Mention some of his other works, underlining those you have read.

6. How may the predicate of a sentence be enlarged? Give examples from the Poem.

Arithmetic (1 *hour.* 100 *marks*).

(Answer Question 1, and *two* others.)

Boys.

1. (*a*) How would you explain to a class beginning fractions the error in the following:—

$$\frac{3}{4} + \frac{2}{7} = \frac{3+2}{4+7} = \frac{5}{11}.$$

(*b*) Show that the difference of two proper fractions cannot be greater than unity.

(*c*) Prove by means of a diagram that—

$$\frac{3}{5} \div 9 = \frac{1}{15}.$$

2. A can do a piece of work in 18 days, and B can do it in 24 days. After they have been working together for 7 days A is taken ill. In how many days will B finish it?

3. Subtract $4\frac{1}{16}$ of £8 12s. 9d. from ·0125 of £813 7s. 6d., and find by what quantity the result must be multiplied to produce £10 9s. 0d.

4. Express $2\frac{5}{8}$ of £1·0875 as a fraction of $1\frac{1}{8}$ of 2·9 guineas.

5. A square chess-board contains 64 equal squares, and the area of each square is 1·3225 sq. in. The rim running round the board is $\frac{3}{8}$ inch wide. Find the length of the board's side.

6. Three men have a pasture for £42 12s. 0d. One puts in 10 oxen for nine months, another 12 oxen for eight months, and the third 14 oxen for seven months. How much should each pay of the rent?

Girls.

1. (*a*) Define Multiple, Measure, H.C.F., G.C.M.

(*b*) What is the least number which divided by 24 leaves a remainder 21, divided by 36 leaves 33, and divided by 48 leaves 45?

(*c*) State clearly the rules for finding L.C.M. of three or more large numbers?

2. Find the rent of 17 acres 3 rds. 19 pls. at £3 3s. 4d. per acre.

3. Make out in proper form, and receipt—
5 galls. of strawberries at 5½d. per qt.
3 score lbs. of potatoes at 5 lbs. for 3½d.
2¼ lbs. tomatoes at 11d. per lb.
2½ pks. of peas at 1s. 5d. per pk.
75 eggs at 9d. per dozen.

4. Reduce to their lowest terms $\frac{111540}{42336}$; $\frac{714285}{999999}$.

5. How would you prove by division of a line that $\frac{1}{2} + \frac{1}{3} + \frac{1}{4} = \frac{7}{8}$?

6. For two parts of an examination there are 572 candidates, $\frac{4}{11}$ of the number entered for part one, and $\frac{5}{13}$ for part two. How many entered for both parts?

Music (15 *min.* 15 *marks*).

(Answer *three* questions.)

1. What is a pulse? What is a measure? When are double bars and brackets used?

2. Write over each note and rest in the following its value in pulses or fractions of a pulse:—

| m :-.f:s, | f :- :m.r | d :- :- | :s.t:d ||

3. Name the intervals:—

te,—fah, ray—lah, me—se', me—doh', lah,—soh.

SECOND YEAR.

English (1 *hour*. 80 *marks*).

(Answer Question 1, and *two* others.)

1. Paraphrase :—

Man in society is like a flower
Blown in its nature-bed ; 'tis there alone
His faculties, expanded in full bloom,
Shine out : there only reach their proper use.
But man associated and leagued with man
By regal warrant, or self-joined by bond
For interest sake, or swarming into clans
Beneath one head for purposes of war,
Like flowers selected from the rest, and bound
And bundled close to fill some crowded vase,
Fades rapidly, and, by compression marred,
Contracts defilement not to be endured.

2. Analyse the following, and parse the words in italics :—

I never framed a wish, or formed a plan
That flattered me with hopes of earthly bliss
But there I laid the scene. There early strayed
My fancy, *ere yet* liberty of choice
Had found me, or the hope *of being free*.

3. Explain the meaning of the prefixes in the following words :—propitious, mischievous, indignant, commercial, entangled, discriminated, supplemental, restraint, associated, immured.

4. Explain the following phrases :—Plashed neatly, a Lethean leave, the Midas' finger of the State, Sidney warbler of poetic prose, chartered boroughs, ingenious Cowley.

5. Write a brief life of Cowper, and quote a few lines to show his love of nature.

6. Explain the different kinds of sentence, illustrating by passage from the form.

Arithmetic (1 *hour*. 100 *marks*.)

(Answer question *one* and *two* others.)

Boys.

1. (*a*) Define Ratio, Proportion, Antecedent, Consequent, Inverse, Reciprocal, and give examples.
(*b*) What is the ratio compounded of the ratios 8 : 2, 9 : 3, 10 : 5.

2. A hare starts 55 yds. before a hound ; if the hare takes 7 leaps of 5 ft. in 3 secs. and the hound 9 leaps of 7 ft. 6 in. in 5 secs., in what time will the hound catch the hare ?

3. If 7 per cent. be lost by selling goods for £145 6s. 3d., how much per cent. would be gained by selling for £168 15s. ?

4. Find the difference between the discount and the interest on a sum of £3,000 payable 5¼ years hence, at 4½ per cent. per annum.

5. If £7,038, when invested in 3½ per cent. stock, yields an income of £252, what is the price of the stock? (Usual brokerage.)

6. Explain the term average, and illustrate your definition by the average length of a calendar month in the year 1898 ; also find the average of 7·125 of 8 guineas, 8·37 of 8s. 3d. and £36 13s. 11d.

Girls.

1. (*a*) State clearly the meaning of each of the following terms : Integer, Fraction, Numerator, Denominator, Proper Fraction, Improper Fraction, and give examples in illustration of your answer.
(*b*) One man's pace is $2\frac{5}{11}$ ft., and another is $2\frac{3}{13}$ ft. ; if they start together, how far will they walk before they are in step again ?

2. Simplify—

$$\tfrac{1}{13} - \tfrac{1}{14} - (\tfrac{1}{14} - \tfrac{1}{15}) - (\tfrac{1}{15} - \tfrac{1}{16}) + \tfrac{3}{210}.$$

3. Simplify—

$$\frac{4(2\frac{1}{5} \times 1\frac{1}{7} \times \frac{3}{8})}{3 + \frac{2}{5 - \frac{6}{7}}} \text{ of 8s. 5d.}$$

4. Find the value of $\frac{7}{8}$ of £1 + ·6 of a guinea $-\frac{3}{8}$ of 6s. 8d. + ·03 of a crown $-\frac{7}{10}$ of a shilling.

5. Out of a cask ⅔ full, 8 gallons are drawn, and it is then found to be 2 gallons less than ⅓ full. How many gallons will the cask hold ?

6. Prove the rule for the conversion of a decimal into a vulgar fraction, and explain what fractions produce finite decimals.

Music (15 *min*. 15 *marks*).

(Answer *three* questions.)

1. Rewrite the following passage, making a change to the first flat key at (*a*) and a return to the original at (*b*).

(*a*) (*b*)

m f r d s ta m f l r f d' t d' r d

2. Name the following intervals :—

doh-lah, *te*$_1$-*lah*$_1$, *ray-soh*, *lah*$_1$-*fah*, *fe-doh*^{1}.

3. Rewrite the following in two-pulse measure, halving the value of each note and rest :—

| d :- .r | m :s .f | m :- .f | s .m :d ‖

School Method (40 *minutes*. 40 *marks*.)

(Answer *two* questions only.)

1. What sort of reading lessons have you found most interesting to young children, and how would you try to secure distinct articulation ?

2. What is the use of 'tracing' in the earlier copybook exercises and what are the objections, if any, to the practice ?

3. What is the use of a 'problem' as an exercise in arithmetic. Frame two questions containing a problem for each of these three standards, the third, the fourth, and the fifth.

4. Explain any way you know of making clear to the eye the process called multiplying $\frac{2}{3}$ by $\frac{1}{4}$.

Euclid (30 *min*. 50 *marks*.)

(Answer *two* questions, including the third if you can.)

Boys.

1. Define a scalene triangle, an acute-angled triangle, and an obtuse-angled triangle.
What is an axiom? Into how many divisions may the axioms be put? Give reasons for your answer.

2. The angles at the base of an isosceles triangle are equal.

3. ABC is an isosceles triangle, of which AB is equal to BC and BD, CE is drawn perpendicular to AC, AB intersect in O. Prove that OD is equal to OE.

THIRD YEAR.

English (*Time* 1 *hour*. 80 *marks*)

(Answer question *one* and *two* others.)

1. Paraphrase the following passage :—

Enjoy your dear wit and gay rhetoric
That *hath* so well been taught her dazzling fence ;
Thou art not fit *to hear thyself* convinced.
Yet should I try, the uncontrolled worth
Of this pure cause would kindle my rapt spirits
To such a flame of sacred vehemence
That dumb things would be moved *to sympathise*,
And the brute earth would lend her nerves and shake
Till all thy magic structures, reared so high
Were shattered into heaps o'er thy false head.

2. Analyse the last 7 lines and parse words in italics.

3. Explain briefly the following :—Melibœus, Saturn's crew, Amphitrite's bower, Stoic fur, Cynic tub, abhorred rites to Hecate, Sweet Queen of Parley.

4. Give the derivation of the following words :—Perplexed, intemperate, adventurous, nocturnal, illusion, unassailed, enchanting, compelled, labyrinth, delusion.

5. What is a 'Masque'? Mention any other of Milton's works which you can, and state briefly what they were about.

6. Give any examples you can remember of words which are used differently in the poem from the meaning in which they are now used.

Arithmetic (1 *hour*. 100 *marks*.)

(Answer question *one* and *two* others.)

Boys.

1. Express in words the arithmetical truths embodied in the following statements, and give numerical examples of each :—

If $a : b :: c : d$, then $a : c :: b : d$, and
$a \times d = b \times c$, and $\frac{b \times c}{a} = d$.

If a is less than b, then the fraction $\frac{a}{b}$ is less than

$$\frac{a+1}{b+1} \text{ but greater than } \frac{a-1}{b-1}.$$

2. Find the true discount on £1,653 8s. 9d. for 4½ months at 4¾ per cent. per annum.

3. A person invests in the 3 per cents. so as to obtain interest at the rate of £2 19s. $3\frac{93}{809}$ per cent. per annum. Find the price of stock.

4. Three men together fill a pit in 2½ hours throwing in respectively 6, 8, and 9 equal shovelfuls of earth per minute. In what time could each man have filled the pit by himself ?

5. Extract the square root of ·892143 of $13\frac{1}{8}$ sq. ft.

6. Two cubical tanks contain together 6, 133, 248 cub. ft., and the edge of one is twice as long as the edge of the other. Find the edge of each.

Music (15 *mins*. 15 *marks*.)

(Answer *three* questions.)

1. Write an ascending minor scale (lah mode), using the minor 6th and major 7th and a descending scale using the minor 6th and minor 7th.

2. What is syncopation ? Give two examples.

3. Explain briefly the meaning of the following musical terms :—Cantabile, calando, a tempo, tempo primo, ad libitum, sf., D.C.

Euclid (30 *minutes*. 50 *marks*.)

(Answer *two* questions including the *third* if you can.)

1. The diagonals of a parallelogram bisect each other.

2. To describe a parallelogram that shall be equal to a given triangle and have one of its angles equal to a given rectilineal angle.

3. The straight line which joins the middle points of two sides of a triangle is parallel to the third side.

Algebra and Mensuration (40 *minutes*. 50 *marks*.)

(Answer *two* questions in Algebra and *one* in Mensuration.)

1. Solve the equations—

(i.) $x - \frac{1}{8}(2x - 57) = 3x - \left(\frac{2x-5}{10} + \frac{5}{3}\right)$.

(ii.) $\frac{6x+7}{9x+6} = \frac{1}{12} + \frac{5x-5}{12x+8}$.

2. Simplify—

(i.) $$\frac{a+b}{b}-\frac{2a}{a+b}+\frac{a^3-a^2b}{b^3-a^2b}.$$

(ii.) $$\frac{1}{x-1}-\frac{3+x}{2(x^2+1)}-\frac{1}{2x+1}.$$

3. Find the square root of

$$4-4ab-15a^2b^2+8a^3b^3+16a^4b^4.$$

Mensuration.

1. Each side of a rhombus is 120 yds. and one of its angles is 60°. Find the area in acres to the nearest whole number.

2. The sides of a triangle in yds. are 26, 51, 55: what fraction of an acre is its area?

School Management (40 *mins.* 40 *marks.*)

(Answer *one* and *two* other questions.)

1. Write notes of a lesson on one of the following subjects:—(*a*) Cocoa, (*b*) Prepositions, (*c*) The Giraffe, (*d*) The number 9.

2. What are the best expedients you know for quickening and securing the attention of a languid or disorderly class.

3. Show that Grammar and Composition may be taught simultaneously from the first.

4. What is meant by 'Good Discipline'? What are the means and ways of improving it?

Papers will be marked, critisised, etc., if sent with P.O. for 1s. 6d. to Mr. A. T. Flux, The Bays, Belvedere, Kent.

SCHOLARSHIP COURSE FOR DECEMBER, 1898.

1. *Reading.*—Ten minutes' oral practice each day to someone who can criticise and correct. Dr. Dunstan's 'Exercises' (Simpkin, Marshall, & Co.) will be found useful to backward students. For this month take Washington Irving's 'Sketch Book.'

2. *Repetition.*—Twenty lines per week till known. Practise orally.

3. *Writing.*—Ten minutes' practice per diem.

4. *Composition.*—Write one or two essays each week, selecting from the following: Birds and their nests; Education; Money, its uses and abuses; Nansen; Advantages of Travelling; War, is it ever justifiable? Industry of the British Nation; Mountain and Lowland Scenery. Map out the essay beforehand, and send one up occasionally for criticism.

5. *English Language and Literature.*

1. Revise the Adjective.

3. Learn 20 roots per week from a good list.

3. Literature from 1066 to 1485. Note that this includes the two periods, Early English up to 1250 and Middle English to 1485, and is the period during which the Anglo-Saxon and Norman-French tongues coalesced to form 'English.' Chief writers: Orm (Ormulum), Layamon (Brut), Langland (Piers Plowman), Tyndal (Testament), Mandeville (Travels), Chaucer (Canterbury Tales, etc.), etc. Note Chaucer and his works particularly.

6. *Arithmetic.*—Read up the theory of Fractions and proofs of all the Rules. Work examples from Text Book of any kinds of which you are doubtful. Be careful with continued Fractions, summation of series, etc.

7. *Algebra.*—H.C.F. and L.C.M. thoroughly, working by factors in all cases where possible.

8. *Euclid.*—Book II., Props. 5-8, and four deductions per week.

9. *Geography.*—Prepare—

(*a*) India.
(*b*) Revise Russia, Austria, and Switzerland.
(*c*) Memory map of England.

Note.—India is very important and requires the closest attention. Climate and Productions, Imports and Exports, States and Towns, and especially Mode of Government, must be thoroughly learnt.

10. *History.*—Henry II. to Henry III. The Angevin Kings. A period of important legislative progress and advance.

11. *Teaching.*—Chap. II. 'Scholarship School Management.'

12. *Needlework.*—See another column.

13. *Domestic Economy.*—Amount and varieties of food required, Milk as a perfect food, the value of Butchers' Meats, etc., and of Vegetables, Condiments and Spices.

14. *Music.*—Chaps. I. and II. 'School Music Teacher.'

15. *French.*—Chap. II. of the 'Philosophe.' Send for a copy of the translation to the office of this Paper (2s.).

16. Continue study of Physiography and practice of Drawing. Any assistance possible will be given on communication.

Test Questions.

English.

1. What is case? How many cases are there in English? Compare these with the cases in Anglo-Saxon.

2. Give in tabular form: (*a*) Nouns that have no plural, (*b*) Nouns that have no singular, (*c*) Nouns plural in form but singular.

3. Explain clearly the various objective cases.

4. What is the difference between gender and sex? How many genders are there in English, and how are feminine forms derived from masculine.

5. Give concise rules for the number of a verb which has more than one nominative.

6. Analyse the following and parse words in italics:—

For *who would bear*
The insolence of office, and the spurns
That patient merit of the *unworthy* takes,
But that the dread of *something* after death—
The undiscovered country from whose bourn
No traveller returns—*puzzles* the will
And makes us *rather* bear those ills we have
Than fly to others that we know not of.

Arithmetic.—G.C.M. and L.C.M.

1. Give all the numbers which are contained an exact number of times in 2808 and 2280. Ans. 2, 3, 4, 6, 8, 12, 24.

2. What is the smallest factor by which 732 must be multiplied to produce a number which shall be divisible by the G.C.M. of 1980 and 2628. Ans. 3.

3. Show that if two numbers be divided by their G.C.M. the quotients are prime to each other.

4. Find the least weight which contains an exact number of pounds Troy or of pounds Avoirdupois. Ans. 144 lbs. Avoir.

5. The G.C.M. of two numbers is 119, their L.C.M. is 11781. One of the numbers is 1071; find the other. Ans. 1309.

6. What number leaves 21 when divided by 24, 33 when divided by 36, and 45 when divided by 48? Ans. 141.

7. The L.C.M. of two numbers is 28035. The only factor of the first not contained in the second is 7, and the only factor of the second not contained in the first is 5. Find their H.C.F. Ans. 801.

Geography.

1. Point out the strategical and commercial importance of Gibraltar, Aden, Hong Kong, and Singapore.

2. What do you know of the Maltese Islands? Draw a sketch map of them.

3. Say what you can of Ceylon under these heads: (*a*) Productions, (*b*) Exports, (*c*) People, (*d*) Towns, (*e*) Government.

4. What are the chief industries of France? In what districts are they carried on?

5. Point out clearly of what 'Germany' consists. Mention a dozen of the chief towns, and give a description of one of them.

6. Describe the course of the Rhine from Basle to Cologne.

History.

1. What were the chief advantages and disadvantages of the Feudal System?

2. What were the chief officers of the Crown in Norman times? How was the revenue obtained?

3. Point out some of the chief results accruing from the Norman Conquest.

4. What do you know of the Investiture dispute?

5. Give some account of the social condition of England in Stephen's reign.

6. What were the Crusades? What do you know of the first?

RULES AS USUAL.

ANSWERS TO CORRESPONDENTS.

All Correspondents answered by post.

EVERY PUPIL TEACHER and EVERY SCHOLARSHIP STUDENT

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OUR 1898 CERTIFICATE CLASS.

BY J. C. HOROBIN, M.A.,
Principal, Cavendish College, Cambridge.

The Examination for Certificates will commence on Monday, 11th July 1898, at 2 p.m.

The general conditions for candidates are to be found in Articles 55–64 and 116–121 of the current Code.

Some Questions on the Theory of Teaching and Notes thereon.

1. Distinguish between 'acquiring' and 'practising,' 'sense impression' and 'sense idea,' and what do you know of 'psychological relation'?

In acquiring, the subject matter must be made focal in consciousness, it must be attended to solely, but in practising marginal consciousness is more in evidence. Compare the strained look of a tyro on a cycle with the inattentive ease of the practised rider. A sense idea is the representation of a sense impression as an echo is of a sound, but the analogy is not complete for a sense idea may be recalled alone, whilst the echo cannot.

Since the child has to acquire all, 'things' are more important than 'words.'

Sense ideas and impressions are connected as generals and particulars, and marginal consciousness is more in evidence in the former than the latter.

Psychological relation is what is perceived. Thus we perceive relations of size, weight, pressure, touch, motion, temperature.

2. Distinguish between sensation, a sensation, sensations.

The two last are connected with the first as particulars to generals.

Sensation is a present (stimulus) or past (idea) sense experience.

The results of the analysis of sensation are described by the other terms.

For example, there are general impressions as motor, smell, sound, apple, but the latter may be differentiated as regards colour, texture, shape, etc.

3. What do you understand by an abstract idea, and how do you explain its formation?

In an impression one element may be predominant. In a series of impressions a common element may be recognisable as predominant in each.

This common element consciously focalised (separately attended to), apart altogether from the impressions (stimulus or ideas), from which it is obtained, is an 'abstract idea.'

4. What do you know of utilitarianism as a system of philosophy?

In this system the morality of actions depends on their utility in securing pleasure. The title is due to Mill, but the system to Bentham, who enunciated the great shibboleth, 'the greatest good of the greatest number.'

It is declared that the chief end of man must be that which is found to be most desirable in (*a*) self-experience, (*b*) extra self-observation; this is determined as pleasure. But according to Mill, though not to Bentham, this implies that pleasures are comparable as for example in intensity, duration, certainty, purity, fecundity. That is, there is a sort of algebraic addition of pleasure and pain, and actions are moral in nature and extent according as the result is positive or negative in pleasure.

But it is clear that here as in Hedonism it is necessary to settle whether the individual or society is to be considered. Most Utilitarians following Bentham are altruists. The objections to this system are mainly two:

(*a*) That experience (racial or individualistic) shows that pleasure is not by any means the most powerful impelling force except to the child and the savage.

(*b*) That to conclude that what is pleasure to the individual is necessarily so to the race is to commit the fallacy of composition.

5. What do you understand by evolution in morality?

Evolution is the transformation of an indefinite all-alikeness to a definite coherent unlikeness. *E.g.*, the series fish, reptile, bird, man, or nebulae to earth.

In morals the series is from a lower to a higher, towards an ideal. An action is good and postulates a better because there is an ideal best. The best is 'happiness,' which is as much a moral intuition as 'space' is an intellectual one.

The supreme moral end is to aid the adaptation of internal and external relations, the making the best of the moral world by co-ordinating the best of the physical and intellectual worlds.

6. What do you understand by Law?

(*a*) It is a rule or command, the expression of the will of a superior.

(*b*) A uniform experience of nature.

Solutions to February Examples.

Arithmetic.

3. Reducing the fractions to their lowest common denominator, the parts are respectively $\frac{30}{77}$, $\frac{20}{77}$, $\frac{15}{77}$, $\frac{12}{77}$, or as the numbers 30, 20, 15, 12, whose sum is 77.

∴ The parts are $\frac{30}{77}$ of £471 12s. 6d. = £183 15s. 0d.
$\frac{20}{77}$ of £471 12s. 6d. = £122 10s. 0d.
$\frac{15}{77}$ of £471 12s. 6d. = £91 17s. 6d.
$\frac{12}{77}$ of £471 12s. 6d. = £73 10s. 0d.

4. (The percentage of a quantity being given, and the rate per cent., to find the quantity.)

$12\frac{1}{2}$ per cent. $= \frac{12\frac{1}{2}}{100} = \frac{1}{8}$ of the sum required;

∴ 7s. 6d. $= \frac{1}{8}$ of the sum required;

∴ sum required = 7s. 6d. × 8 = £3.

5. Find the interest at the given rate for ONE YEAR; this will be

$$£540 \times \frac{3\frac{1}{2}}{100} = £\frac{189}{10},$$

Then number of years = *to whole interest*

$$= \frac{£63}{£\frac{189}{10}} = 3\frac{1}{3} \text{ interest for } \textit{one year}.$$

6. The interest for the half year is

$\frac{1}{2}$ of 4 per cent. = 2 per cent.

£1760 10s. 0d.	=	£ 1760·5	= 1st Principal.
		70·42	= 1st year's Interest.
		1830·92	= 2nd Principal.
		73·2368	= 2nd year's Interest.
		1904·1568	= 3rd Principal.
		38·083136	= Half-year's Interest.
		1942·239936	= Amount at end of $2\frac{1}{2}$ years.
		1760·5	= Original Principal.
		£181·739936	= Interest required.

£181·739936 = £181 14s. 9·58464d.

A.—Examples for March.

1. Prove diagrammatically that $\frac{2}{3}$ of $\frac{5}{7} = \frac{10}{21}$.

2. Prove diagrammatically that $\frac{1}{4} \div \frac{3}{5} = \frac{5}{12}$.

3. A bill upon Amsterdam is bought at 12 florins per £1 sterling. The proceeds purchase at Amsterdam bills upon Hamburgh at $34\frac{1}{2}$ fl. for 40 marks. These sold in Paris fetch 185 fr. per 100 marks. What is the rate of exchange between London and Paris?

4. A person who has £7800 stock in a company paying 5% sells out at 125 and invests in a 4% stock at $97\frac{3}{4}$. What change in income is there?

5. A debt of £744 6s. is due 9 months hence and the discount is £24 6s. Find the rate per cent.

Syllabus of Work for the Month.

Students are advised not only to get up the work indicated, but also to use the test questions as indications of work to be got up and afterwards written out.

First Year.

School Management.

1. Qualifications necessary for teacher.
2. Questioning and answering.
3. Use and abuse of fairy stories.
4. Diagrams for proving rules in fractions.

Composition.

1. Times of Shakespeare.
2. Comparison of Wordsworth and Lamb.
3. Habit.
4. Free trade.

Arithmetic.

Not less than six examples from miscellaneous sets ought to be worked per week, as well as those on the particular work set and the examination questions given.

1. Pars. 251–254, P.
   ,, 382–3, and examples on them.
2. Pars. 255–259, P.
   ,, 382–3, and examples on them.
3. Pars. 260–262, P.
   Revise 375–383.
4. Pars. 263–268, P.
   Revise 375–383.

Music.

1. Suitable exercises for Div. I.
2. ,, ,, Div. II.
3. ,, ,, Div. III.
4. Revise 1–3, and the mental effects of the notes used.

English.

1. Classification and inflection of adverbs.
2. Periods of English and their chief marks.
3. Prepositions and conjunctions.
4. English and Keltic elements in the language.

Literature.

1. Lamb—'Valentine's Day'—Revise Introduction.
   Wordsworth—Sonnets 41–50.
2. Lamb—'My Relations'—'S. S. House.'
   Wordsworth—'Evening Voluntaries'—'Power of Music.'
3. Lamb—'Makery End'—Revise Introduction.
   Wordsworth—Sonnets 51–60.
4. Lamb—'My First Play'—'New Year's Eve.'
   Wordsworth—'Lady Fleming'—'Stargazers.'

Geography.

1. The Alps: Rivers—lakes—passes—railways.
2. Inter-communication in Spain and Portugal.
3. Canals of British Isles.
4. Telegraph routes in Europe and their connection with British Isles.

History.

1. Henry V.—Napoleon—Washington—New Model.
2. Perceval Ministry—Warwick—Joan D'Arc.
3. Henry VI.—Wellington—Peel—Grand Remonstrance.
4. Liverpool Ministry—Cade—Lollards.

MEN ONLY.

Algebra.

1. Proof of all rules in Fractions.
2. ,, ,, Progressions.
3. ,, rules for H.C.F. and L.C.M.
4. Relations of roots and coefficients in Q.E.

Geometry.

1. Book I. 1–5.
   ,, II. 5 and 12.
   ,, III. 27–29.
2. Book I. 6–10.
   ,, II. 6 and 13.
   ,, III. 30–32.
3. Book I. 11–15.
   ,, II. 7 and 14.
   ,, III. 33–35.
4. Book I. 16–20.
   ,, II. Revise 9 and 12.
   ,, III. 36–39.

WOMEN ONLY.

Needlework.

Sleeve of a chemise—stitching—feather stitching.

Domestic Economy.

1. Digestion and the organs concerned.
2. Servants and their duties.
3. Breathing and the organs concerned.
4. First Aid.

OR, *Geometry.*

Euclid. Revised Definitions.
,, Props. I. 1–5.

SECOND YEAR.

Composition., *Music.*, *Arithmetic.*, *Geography.* } As First Year.

School Management.

1. First two weeks of First Year.
   Notes on Theory of Teaching.
2. Fitch I.
   Sense impressions—concept—perceiving.
3. Second two weeks of First Year.
   Notes on Theory of Teaching.
4. Fitch II.
   Association and its laws—examples of kinds—inaccurate observation—cause and cure.

English.

Wordsworth as First Year in each week.

1. 'Hamlet,' Act V. Sc. 1.—Sources and sketch of plot.
2. 'M.N.D.'—Revise introduction and the characters.
3. 'Hamlet,' Act V., Sc. 2.—Principal characters.
4. 'M.N.D.'—As Second week.

MEN ONLY.

Algebra.

As First Year.

1. Binomial Theorem.
2. Proof of Rules, Permutations, and Combinations.
3. Binomial Theorem.
4. Examples in Permutations and Combinations.

Geometry.

As First Year.

1. Book IV. Prop. 6.
   ,, VI. ,, 15.
2. ,, IV. ,, 7.
   ,, VI. ,, 16.
3. ,, IV. ,, 8.
   ,, VI. ,, 17.
4. ,, IV. ,, 9.
   ,, VI. ,, 18.

WOMEN ONLY.

Needlework.

As First Year.
Yoked muslin pinafore.

Domestic Economy.

As First Year.

1. Investments and Savings.
2. Household expenses.
3. Servants and their duties.
4. Revise 1–3.

Geometry OR,

Euclid as First Year.
Also Propositions 40–44

QUESTIONS FOR TESTS.

FIRST YEAR.

Penmanship.

1. Write in large, text, and small hand—

'The darkest day
Wait till tomorrow, will have passed away.'

School Management.

1. Supposing that you had to begin to teach English grammar to a class of children in the Fourth Standard, who had not learnt it in the lower standards, draw out a syllabus of your first quarter's work.

2. What explanations should you give to a class of elder children who were reading the following passage:—'For all that, Brian was an unmistakable king, and proved himself to be one. He defeated the Danes again and again, reducing even those inveterate disturbers of the peace to a forced quiescence; entered Dublin, and remained there some time, taking, say the annalists, 'hostages and treasure.' By the year 1002, Ireland had a master, one whose influence made itself felt over its whole surface. For twelve years at least out of its distracted history the country knew the blessings of peace. Broken by defeat, the Danish dwellers of the seaport towns began to turn their energies to the milder and more pacific activities of trade.'

Composition.

Write a brief essay on:—

1. The subject for Penmanship.
2. Bounties.

Music.

1. Name the following relations of the minor or *lah* mode :—(1) Dominant ; (2) Minor or essential sixth ; (3) Leading note or essential seventh ; (4) Supertonic.

2. Which of the following tones is highest in pitch and which lowest ?—

(*a*) **f** in key C ; (*b*) **r** in key G ; (*c*) **l** in key B♭ ; (*d*) $\mathbf{f}_1$ in key A ; (*e*) $\mathbf{t}_1$ in key D ; (*f*) **s** in key F ; $\mathbf{r}^1$ in key E♭.

3. Work the following values in three-pulse measure. The figures show duration in pulses or fractions of a pulse. Begin on a strong pulse :—

1 ¾ ¼ 1	1½ ½ ½ ½	2 ¼ ¼ ½	1½ ¾ 1	½ ½ 1 1	2 1
s d r m	f m r REST	l r m f	s m d	r m f t_1	d REST.

4. Write (in figures) very distinctly over each note and rest in the following its value in pulses or fractions of a pulse .—

m.	:f .,s	:m .f,s	l	:-.s,f	:m .s
f_1 -,s	:m	:d	‖		

English.

1. Parse all the words ending in *ing* in sonnets 45, 50.

2. Comment upon : for spent, Dido, yclept, rocket, icy domes, Gorgons, subpœna, anile, Keck, congeeing, true touch, orrery, mollia tempora fandi.

Geography.

1. Write an account of the indigenous races of Europe.

2. Where and what do you know about—Bornholm, Milo, Dalmatia, Bremen, St. Gothard, Simplon, Dunkirk, Milan, Schleswig-Holstein, Tyrol, Palermo, Abo.

History.

1. Describe some of the consequences of the Norman invasion.

2. What caused the Wars of the Roses, and what were some of their results ?

3. What reasons may be alleged to justify Queen Elizabeth's treatment of Mary Queen of Scots ?

4. What were the chief causes which led to the Revolution of 1688 ?

SECOND YEAR.

Penmanship, *Geography*, *Music*, *Arithmetic*, *Composition* } As First Year.

English.

1. Question 1 of First Year.

2. Write an account of the plot of M. N. D.

3. Analyse Act III. Sc. 4, Lines 137–153.

School Management.

1. The questions of First Year.

2. Draw up a register showing the attendances of a class of 10, two of which are half-timers. What is the average, and what entries would be made in the summary register ?

History.

1. What additions were made to the empire from 1800 to 1832 ?

2. Write an account of Pitt the younger and Nelson.

WOMEN ONLY.—FIRST YEAR.

Needlework.

1. Cut out and make up an infant's shirt.

2. Show on a piece of calico all the stitches necessary, and work a buttonhole.

Domestic Economy.

1. Describe the process of breathing.

2. What do you know of the teeth, and why is it necessary to clean them, and when ?

OR

1. Define line, angle, circle, and quote Postulate and Axiom 5.

2. Prove Props. 7 and 15.
All the angles about a point are four right angles.

MEN ONLY.

Algebra.

1. If a quantity is a factor of both a and b, it is also a factor of $ma + nb$. Find the G.C.M. of $4x^3 - 27x^2 + 58x - 39$ and $x^3 - 8x + 19x - 12$.

2. Simplify—

$$\frac{a}{b} - \frac{a^3 - b^3}{b^3}x + \frac{a(a^2 - b^2)x^6}{b^3(b + ax)},$$

and find the value of

$$\left(\frac{x}{x-1}\right)^2 + \left(\frac{x}{x+1}\right)^2 \text{ when } x = \sqrt{\frac{a-b}{a+b}}.$$

3. Find the square root of—

$$16x^6 - 24x^5 + 33x^4 - 50x^3 + 33x^2 - 24x + 16,$$

and prove that

$$\left(\frac{2a}{a-b} - 1\right)^2 + (-b^1)\left\{\left(\frac{2}{a-b}\right)^2 - 1\right\}$$

is a square.

Euclid.

1. Prove I. 20. If any point within a triangle be joined to its angular points, the sum of the joining lines is greater than the semiperimeter.

2. Prove I. 21. The sum of the three medians of a triangle is less than its perimeter.

3. Prove I. 19. The perimeter of a quadrilateral is greater than the sum of its diagonals.

4. Prove II. 7. Given the difference of two lines is A, and their rectangle is $(2A)^2$; find the lines.

5. Prove III. 16. Draw a parallel to a given line to touch a given circle.

6. Prove III. 12. Describe a circle of given radius that shall touch two given circles.

WOMEN ONLY.—SECOND YEAR.

1. Cut out and tack together one leg of a child's pair of drawers, and on the calico supplied show all the stitches required.

Domestic Economy.

1. Point out some forms of thriftlessness or extravagance common among the poorer classes.

2. Explain what is meant by 'National Insurance,' with reasons for or against the scheme.

3. Mention any dangers incident to the use of (1) gas, (2) paraffine lamps ; and show how these dangers may be avoided.

OR

Geometry.

1. As First Year.

2. Prove I. 18 and I. 26.
Show that the bisector of an angle of an equilateral triangle cuts the side rectangularly.

MEN ONLY.—SECOND YEAR.

Algebra.

1. As First Year.

2. Find the greatest term in the expansion of $(1 + x)^n$ when n is a positive integer.
Find the coefficient of the term involving $x^n y^n$ in the expansion of $(1 + x + y + xy)^{2n}$.
(Resolve the expression within brackets into factors.)

3. A contractor employs two gangs of workmen equal in number, but a workman of one gang does as much in 4 days as a workman of the other in 5. The wages of the superior workman are 28s., of the inferior 21s. per week. The contractor finds that if he employs both gangs on a piece of work he will spend £175 more but finish the work in 25 weeks less than if he employed the inferior gang only. Find how many men he employed.

Euclid.

1. As First Year.

2. Define *multiple*, *proportion*, *ex æquali*, *similar triangles*.
QS, RS are perpendicular to the sides PQ, PR of a triangle, and RX perpendicular to PS cuts PQ at X ; show that the triangles PQR, PXR are similar.

3. The sides about the equal angles of triangles which are equiangular to one another are proportionals, and those which are opposite to the equal angles are homologous sides—that is, are the antecedents or the consequents of the ratios.
PQR is a triangle inscribed in a circle, and QK, drawn parallel to the tangent at P, meets PR or PR produced at K. Show that PQ is a mean proportional between PR, PK.

OUR SCIENCE SECTION

THE SCIENCE AND ART DEPARTMENT'S NEW CALENDAR.

THE full title of this recently issued Blue Book is as follows:—'Calendar, History and General Summary of Regulations of the Department of Science and Art, 1898.'

Within the compass of its cviii + 275 pp. it contains tabulated matter concerning all kinds and classes of science and art schools, together with the usual new edition of the history of the Department of Science and Art, a perusal of which latter portion of the volume is not very inspiriting, since it but serves to show how conservative this Government Department is, the new matter in its history being very inconsiderable. The General Summary of Regulations is merely an outline of the Science Directory, and therefore needs no comment here, as we dealt very fully with the publication immediately upon its appearance.

Exit the Drawing Examination.—That clause in the calendar which chronicles the end of the examination in drawing and in manual training will bear lifting, we therefore reproduce it. 'In accordance with the recommendation of the Committee appointed by the Lord President in October 1896, "to inquire into the distribution of Science and Art grants," that the administration of the grants for drawing and manual instruction should be transferred in England and Wales and in Scotland to the English and Scotch Education Departments respectively, the transfer will take effect from and after the 31st March 1898, as respects drawing and manual instruction in Public Elementary Day Schools; and as respects drawing in Evening Continuation Schools, the transfer will take effect from 30th April 1898, and end on the current session common to all such schools.'

A further boon to Scotland.—'In 1897 it was decided that the distribution of grants for art instruction and attendances in Schools of Art and Art Classes in Scotland should be transferred to the Scottish Education Department in 1898. At the same time the privileges of Schools of Art and Art Classes in Scotland that participate in the late scheme of Examinations in Art have been preserved, the admission of students at such schools to these examinations being subject to the approval of the Scottish Education Department.'

Money to be spent in 1897-8.—The estimates for the past year were **£760,795.** For the current year this is expected to run to £815,992, an increase of a little over fifty-five thousand pounds.

The Whisky Money.—The amount available under the Local Taxation Act of 1890, which is generally and irreverently but not irrelevantly spoken of as the 'whisky money,' is **£845,000** as opposed to £813,000 for 1895-6. Thus from these two sources a little over one and half millions of money is to be spent in the scientific and technical teaching of the country. We should be more pleased to see twice the amount available, knowing, as we do, that it could be well and profitably spent.

Schools of Science.—Of these useful institutions, concerning which so much has lately been heard, there are now **169,** on the rolls of which there are **20,879** students. Here again we shall be pleased to record a more notable gain than the present figures show, the number of schools of this class having only increased 57 during the past four years, 25 of which, however, have been added this year. It is painful to contemplate that these 20,879 seekers after more light would have been turned empty away had the unfortunate circular remained in force. Even now there is a feeling of uncertainty as to how the modified circular will affect their continued existence should it be allowed to remain in force.

A tabular glance at 10 years' progress.—

—	Year.	No. of Institutions.	No. of Classes.	No. of Persons Examined	No. of Papers Worked.	Direct Payment in Results.
						£ s.
Science Schools	1886	1,652	5,862	54,462	114,432	73,142 0
	1896	2,439	9,375	91,300	152,630	157,916 0
Training Colleges	1886	42	131	2,638	3,809	5,132 0
	1896	62	269	4,571	8,430	10,666 10
Schools of Science	1886	10	Included in the above.			
	1896	144				

Manual Instruction.—The figures given in this connection are very instructive.

—	No. of Schools.	No. of Scholars.	Grant.
			£
1890	63	2,568	600
1891	1,069	85,220	19,530
1897	1,387	112,000	—

Art.—The figures given refer to 1896. They show a gratifying increase in all departments. In all there were 2,445,785 students receiving instruction through the agency of the Department, the direct payments in grants on account of which amounted to £253,983 as opposed to £72,673 ten years ago.

Popularity of Subjects.—An interesting table appears on pp. 211 and 212 of the Calendar, whereby one may gauge the popularity of the 25 subjects coming under the purview as Science Subjects.

In the elementary stage of Subject V., **Mathematics**, there were **40,244** students. In Subject X., Inorganic **Chemistry, 26,433** students are recorded; whilst Subject I., **Solid Geometry,** comes next with 24,069 entries: and next comes **Physiography,** with its roll of **22,009.** Poor **Mineralogy** totals only **152,** being patronised least of all; the next in order of minority being Zoology with **189** entries. Of **Practical Subjects,** Chemistry is a good first, with **15,169** students; and Zoology with 109 comes next in order.

A complete list of Science and Art Classes is given, the list monopolising, as might be expected, the lion's share of the space. The price of the book is 1s. 7d., and it is obtainable at the usual Government agents, viz., Eyre and Spottiswoode for England; Menzies and Co. for Scotland; and Hodges Figgis and Co. for Ireland.

☞ Our Readers may expect next month an Illustrated Contribution entitled—

'THE SCHOOL JOURNEY,'

A Means of Teaching Geography Illustrated by References to an actual Excursion in the Field.

By JOSEPH COWHAM F.G.S., *Lecturer on Education, Westminster Training College.*

NOTES ON PHYSIOLOGY:

EMBRACING THE SUBJECTS OF THE ADVANCED AND HONOURS STAGES, SCIENCE AND ART DEPARTMENT.

BY WALKER OVEREND, M.A., M.D. (OXON), B.SC. (LONDON),

Physician to the Tottenham Hospital;
Late Radcliffe Fellow, Scholar of Balliol College, and Exhibitioner in Comparative Anatomy of the London University.

(*Continued from* p. 325.)

WE shall consider several important questions on the blood and circulation.

1. *The Life History of the Red Corpuscles.*—The colouring matter of the red corpuscles is the source of the bilirubin, or pigment of the bile. As this is continually being lost to the body through the faeces, it follows that the disintegration of a certain number of red corpuscles must occur every day. Inasmuch as they do not diminish numerically, it is believed that red corpuscles are formed in the red marrow of the bones and in the spleen. Both contain *nucleated* coloured corpuscles, and it is thought that these divide into two or more, each division becoming a red blood corpuscle, while the nucleus disappears. We cannot tell how long a red blood corpuscle lives, or how long it is able to perform its function of carrying oxygen to the tissues, but there is evidence to prove that when it becomes inelastic and old it is broken up within the spleen and liver, and its colouring matter becomes bile pigment.

2. *The Composition of the Blood.*—The blood consists of the *plasma* and the *corpuscles*. Of these rather more than one half the weight consists of the plasma. On escaping from the body the latter coagulates, and then resolves itself into *serum* and *fibrin*. The serum contains about 10 per cent. solids and 90 per cent. water. Of the solids the chief are proteids—8 parts—consisting of serum-albumin, and serum-globulin; also of salts, about 1 part, and the chief of these are sodium chloride and sodium carbonate. There are also minute quantities of calcium chloride and of phosphates of potassium, sodium, and calcium, also small quantities of urea and fat.

The red corpuscles contain about 30 per cent. solids and 70 per cent. water. Of the solids the colouring matter, hæmoglobin is by far the most important. The red corpuscles also contain a proteid, viz., globulin; and potassium phosphate. The white corpuscles consist of proteids, chiefly globulin, and certain salts, as potassium phosphate.

3. *The Composition of Lymph.*—If it is obtained from the thoracic duct after a meal it is milky, on account of the presence of minute particles of fat absorbed from the small intestine. With the microscope lymph is seen to contain colourless corpuscles, called leucocytes, which resemble the white blood corpuscles. Lymph is alkaline in reaction, and coagulates just like the blood-plasma. It contains about 5 per cent. solids—fibrinogen, globulin, and serum-albumin.

4. *The Changes occurring in the Heart during each Contraction.*—If the heart of a rabbit be exposed by opening the chest, and keeping the animal alive by means of artificial respiration, the movements can be observed. The great veins near the heart—venæ cavæ and pulmonary veins—contract first, and immediately the two auricles contract sharply down towards the ventricles. Then the ventricles contract simultaneously (from the base towards the apex). During contraction the ventricles change in shape, so that the circumference becomes more circular; also the heart becomes shorter. There is also with each systole of the ventricles a slight twisting of the apex forward and towards the right. The systole of the ventricles is followed by relaxation (diastole). During the pause, or diastole, the blood is flowing steadily into the right auricle, and thence into the right ventricle. When the venæ cavæ contract the stream is hurried forwards, and again when the right auricle contracts. The tricuspid valve being open, the blood rushes into the right ventricle and distends it. The blood, passing around the sides of the ventricle, floats up the flaps of the tricuspid valve, until they meet and close the opening. As the right ventricle shortens the papillary muscles contract, and prevent the valves from being pushed into the right auricle. As soon as the pressure reaches a certain amount, the semilunar valves of the pulmonary artery are burst open, and the blood flows out of the ventricle. This continues during the whole of the systole. Immediately it ceases the backward currents of the blood close the semilunar valves suddenly, and stretch the flaps, producing the *second sound*. A similar sequence of events occurs at the same time on the left side of the heart. In man a cardiac cycle takes up about eight-tenths of a second, and the time is occupied thus:—

Systole of auricle, one-tenth second.
,, ventricle, three-tenths second.
Diastole, four-tenths second.

The first sound of the heart is low-pitched, and lasts longer than the second. It is produced by the contraction of the muscle of the ventricle (when a muscle contracts—as the biceps of the arm—a low sound may be heard with the stethoscope, which is called the muscle sound). By means of special appliances a high, short note may be detected with the first sound, and this is apparently due to sudden stretching of the auriculo-ventricular valves.

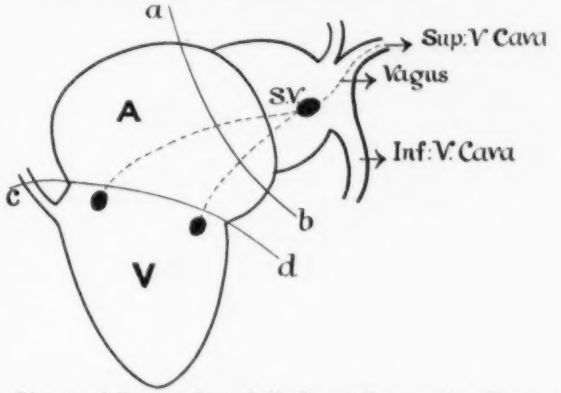

Diagram of Heart of Frog.—S. V., Venous Sinus, or Sinus Venosus; A, Auricle; V, Ventricle; *a*, *b*, first ligature; *c*, *d*, second ligature.

5. *The Rhythm of the Heart.*—Since the heart beats for a time after it is removed from the body, and when, therefore, it is deprived of blood the cause of its rhythmical movement must be in itself. The heart of the frog consists of the *sinus venosus* (into which the venæ cavæ open), two auricles, one ventricle and aorta. Now, if a ligature (see diagram) of silk thread be placed around the junction of the auricles and the sinus, and tightened, the heart stands still for perhaps twenty minutes, whilst the sinus goes on beating. In this condition the heart is said to be stanniused, after the physiologist Stannius, who first performed the experiment many years ago. During this interval, if the ventricle be touched with a pin, or stimulated by an electric shock, it beats just once, that is, it gives a single beat. This is called the *first ligature*. If a ligature be now tied around the auriculo-ventricular groove (*c d*), then the ventricle begins to contract. This is the *second ligature*. The vagus nerves end in a collection of ganglion cells in the sinus (ganglion of Remak), from which fibres pass to two collections of ganglion cells in the auriculo-ventricular groove (ganglion of Bidder), and an explanation of the above facts was formerly attempted by assigning motor and inhibitory functions to the ganglia. But if a strip from the lower two-thirds of the ventricle from the heart of the tortoise be kept for a time in a moist atmosphere, after some hours it will begin to beat rhythmically: and in this part of the ventricle there are no ganglion cells at all. The power of rhythmical movement seems therefore to reside within the muscular fibres themselves. Our explanation of the Stannius' experiment would then be:—

Each part of the heart possesses a power of independent rhythm, but under ordinary circumstances the rhythm is started by, and is dependent upon, the sinus venosus. From the sinus venosus the contraction reaches the auricles, being passed on from muscle-cell to muscle-cell. The first ligature stops this sequence of events, and it takes a time before the auricle and ventricle begin independently. After about twenty minutes they do begin again. When the second ligature is tied, the ventricle beats rapidly at first, but soon settles down to a steady rhythm. The second ligature appears to have stimulated the muscular fibres.

The process of contraction in the heart of a rabbit and higher animals is essentially the same as in that of the frog. It starts in the great veins, and travels quickly over the auricles to the ventricles.

6. *The Nerves of the Heart.*—Two sets of nerves reach the heart from the central nervous system. The vagus nerves send branches, and also the sympathetic chain. Now, if the latter fibres are stimulated by induction shocks, the beats of the heart increase in force as well as in frequency. These fibres are therefore termed *augmenting* nerves. On the other hand, when the vagus is stimulated the heart suddenly stops in diastole. If the electric current be then discontinued, the heart, after a while, begins to beat again. The vagus is termed the *inhibitory* nerve. That portion of the medulla from

which the cardiac branches of the vagus arise is termed the cardio-inhibitory centre. It may be stimulated reflexly from other nerves. A sudden blow in the abdomen may cause the heart to stop reflexly.

7. *The Nerves of the Blood Vessels.*—When the sympathetic nerve in the neck of a rabbit is cut through, and the ear examined in a strong light, the latter becomes quite red, and many little vessels start up where no vessels had been previously visible. The ear also becomes quite warm. If the end of the sympathetic, which goes to the ear, be now stimulated by an electric current, the ear again becomes pale, and the blood vessels much less visible.

The nerves running to the arteries pierce the outer coat and end in the muscular fibres of the middle coat. These fibres are arranged in the form of a ring. During life the muscular fibres are kept in a moderate degree of contraction by means of impulses passing from the medulla oblongata, since, if the medulla be separated from the spinal cord, all the arteries in the body dilate, and blood pressure sinks enormously. There is a certain portion of the medulla which is connected with all the nerve-fibres of the blood vessels, which is termed the *general vaso-motor centre*, and the fibres which spring from it, are termed *vaso-motor nerves*. We have said that the arteries during life are kept in a moderate degree of contraction, in other words, the arteries possess *tone*. This may be modified in two directions; it may be increased or diminished, and this is effected by vaso-motor nerves carrying impulses from the centre. Those which increase the tone, or contract the vessels, are termed *vaso-contracting*; those which lower the tone and dilate the vessels are termed *vaso-dilating* fibres. The best example of the vaso-dilating nerve is the *chorda tympani*, which springs from the facial nerve, runs through the tympanum, and immediately after leaving it joins the gustatory branch of the fifth nerve, and sends branches to the submaxillary and sublingual salivary glands. When the chorda is divided and the end in connection with the submaxillary gland is stimulated, its blood vessels dilate, and the whole gland becomes flushed with blood. At the same time saliva is secreted. On the other hand, all the nerves in the cervical sympathetic nerve system appear to be vaso-constricting.

PHYSIOGRAPHY NOTES.

The Eclipse of the Sun.—It is too early in the day to say anything as to the results of the very careful observation of the total eclipse of January 21st. Everywhere a cloudless sky rendered the observers' work easy, and much valuable information concerning the corona, the prominences, and other solar topics will, it is believed, in due time, be gleaned; but the development, and above all the study, of the various observations will occupy considerable time.

The Corona.—An observer describes the appearance of the corona in the following terms: 'Mrs. Horsburgh had made an admirable sketch of the corona on one of the diagrams prepared. To a short-sighted observer the general coronal appearance was that of **two** extensions diametrically opposite, and extending on the N.E. and S.W. directions, giving to the whole object the appearance of an ellipse with the extremities of its major and minor axes cut off. Closer examination showed that the N.E. extension was bilobed, and that the S.W. one was of great extent, being easily seen to a distance of **two millions of miles** from the sun. Round the north and south solar poles the corona was contracted, and at some stations, notably at Buxur and at Jena, it was seen to be **combed out into rays and filaments.** Photographs show in addition that these polar rays are not in all cases radial, but that some are inclined at an angle to the solar surface. A filament could also be seen, traced in a spiral curve across the surface of the great south-west extension. Some **six or seven prominences** were plainly visible.'

Professor Milne and the Bed of the Ocean.—In a recent lecture at the London Institution, Professor Milne said that there were secular changes in the bed of the ocean, just as in the case of land areas; also there were earthquakes of the sea just as of the land. The upheavals from the sea were notable in South America, where there were very steep volcanic slopes from what were termed chains of mountains, which discharge materials into the water in large quantities. Submarine landslips often occurred and buried cables previously thought to be quite secure. Sometimes great upheaval would produce a wave which was so powerful that it disturbed the whole Pacific Ocean.

Phenomenal Magnetic Elements.—At Korusk in Russia M. Moureaux has made some very interesting magnetic observations. The whole area of this province is intensely disturbed, and the differences between theory and observation are so great that it is not possible to draw isomagnetic lines. At two points situated about **450 yards apart the declinations are** $-11°$ and $+45°$. In one district the declination at two stations about **a mile and a quarter apart varied from** $-34°$ **to** $+96°$. The **dip** ranged from **48° to 79°**, and the **horizontal component** reached **·59**, whereas the maximum normal value of this element in the equatorial regions is below ·4. From these observations it results that the magnetic force in the locality is as great as it would be in the immediate vicinity of the magnetic poles. So far as is at present known, there is nothing near the surface of the ground to cause these anomalies.

Sun Spots.—In the *Astrophysical Journal*, Professor George E. Hale considers the conclusions which seem to be at variance with the idea that the sun spots are depressions, and suggests that spots may be **hollows in comparatively small areas of the photosphere which are raised above the ordinary level**; for most admit that the penumbra is at a higher level than the umbra, and it cannot be doubted that penumbral filaments overlie the umbra, and frequently unite to form bridges passing completely across it. This theory, so far as he has examined it, seems to reconcile the conflicting testimony offered by the supporters of the two views. Notches at the sun's limit are accounted for by assuming that the side of the spot nearest us is somewhat lower than the opposite penumbra, and the darkening of the limit might thus be produced by the smaller radiations of the penumbra.

An Immense Lava Area.—The immense lava sheets that cover an area of some two hundred thousand square miles in the Deccan of India have been looked upon as the grandest example of vulcanism in the world; but an even more extensive outpouring of similar material must formerly have been evident in the northern hemisphere, if we accept the conclusions reached by Messrs. Nerton and Teall from a study of the geological collections made in Franz Josef Land by the Jackson-Harmsworth expedition. The archipelago is formed of the fragments of an ancient basalt-plateau, which must have stretched far beyond its present limits. Similar igneous rocks are found in Spitzbergen, the Faroës, the Hebrides, and North Island; and the authors are inclined to regard all these areas as the isolated fragments of a formerly continuous land area, the greater part of which has sunk to form the southern portion of the North Atlantic Ocean. The period of this outpouring of lava was probably the end of Cretaceous and the beginning of Tertiary times. This period seems to have been distinguished by similar occurrences in other parts of the world, for the great lava flows of the Deccan and of Abyssinia are of the same age.—*Nature.*

REPORT OF THE EXAMINERS IN PHYSIOGRAPHY.

Section I.—The remarks on this subject are in the main favourable. The complaints are: (1) Students did not understand that the **weight of the specific gravity flask** must be ascertained when determining the relative density of liquids by this method. (2) The need for a **jacket** in graduating a thermometer was not expressed. (3) Division D of the syllabus does not appear to have been illustrated by experiments.

Elementary Stage.—The specific points of complaint are: (1) **Burning phosphorus in a closed flask.** It was not seen that there is a mere readjustment of materials, and therefore no change in weight, thus proving the **indestructibility of matter.** (2) **The rubbed button.** It was not seen that mechanical action had been converted into the molecular vibrations which we call heat; nor was it said that the cooling is due to loss by **conduction, convection,** and **radiation.** (3) **Barometer.** The idea of a balance between a short column of mercury and a long column of air is not grasped, hence the higher column at the bottom is put down to a denser air, and not to a longer column. (4) **Convection currents** are not understood. (5) **The action of living beings upon the solid, liquid, and gaseous constituents of the earth is not appreciated,** as shown by the answers respecting the origin of **limestone** and **coal,** and the action of plants and animals on the air. (6) **The prism is not known,** nor is it grasped that divergence begins immediately upon the entry of the light into the prism. (7) **Eclipse of the sun** was badly described—*e.g.*, the shadow of the moon on the **sun.** (8) **Equation of time** badly understood. (9) **Degrees of latitude are angular distances measured along a meridian.** This was not properly expressed. (10) **Chief property of a lodestone**—viz., that it is north-seeking—was badly understood. (11) **Dip** was measured **from the vertical instead of from the horizontal.** (12) **Planes of the ecliptic and equator and angle between them** not known.

It will be wise for teachers to make assurance doubly sure as regards the above, as the questions for next year will certainly bear very directly upon them. In particular, a question on the equation of time and one on the barometer are bound to come. Spelling is complained of, and teachers are recommended to see that each stage of an experiment is thoroughly understood. Moreover, the examiners explicitly state that the questions are so devised as to be pitfalls for those who trust to books and not to experiments, so that

it will be woe-betide the teacher or the student who does not put his faith in experiments frequently repeated and thoroughly grasped both as to their details and as to the truths they are intended to illustrate.

The Howlers.—No report would be complete without a due assortment of howlers. This year the undesired pre-eminence in this particular is the portion of the unhappy wight who described **the principal impurities of water as being gibson chalk and insects.** It is to be hoped that Messrs. Rücher and Tilden passed this luckless one, as a slight acknowledgment of the merriment afforded.

Advanced.—(1) **Pendulum**-time of vibration independent of length of **string** instead of **swing.** (2) **Slowness of iceberg melting.** The heat liquefaction was not taken into consideration. (3) **Lake filling.** The filter action of lakes not understood. (4) **Glaciers not known,** especially in respect to their resemblance to and difference from rivers. (5) **Elements of the earth's magnetism.** 'In some cases iron and lodestone were given as the elements.' (6) **Time of Earth rotation.** The use of the transit instrument in this connection was not understood. (7) **Proper motion of Stars** not studied, and again the use of the transit instrument was not understood. (8) **Infra red and ultra violet of the Spectrum.** Examinees must actually see a spectrum. This is not the case at present. (9) **Precession and Nutation** only known parrot fashion. (10) **Parallax.** 'Unit of distance not understood in this connection.' (11) **Position of Stars and How Ascertained.** Declination and right ascension appear to be burked, whereat the examiners complain.

Here again the reader may see several of next year's questions writ large. The **Transit Instrument** will come, so will **Proper Motion** as well as **Precession** and **Nutation,** to say nothing of **Parallax** and **Spectrum Analysis.**

Honours.—We will quote the whole of the report on this section: 'The Honours papers call for little remark. A few excellent papers—as far as the astronomical questions are concerned—and a few papers with good answers on the subject of terrestrial physiography were worthy of note; but the cases in which anything like equal knowledge of both branches was shown were quite exceptional. The great mass of the candidates who attempted the Honours papers in this subject were altogether unequal to the task they set themselves to accomplish. **Teachers would do well to impress on their scholars the fact that it is quite useless for any students, except those with some training in physics, chemistry, and biology, who have in addition undertaken a special and extensive course of reading, to attempt to answer the Honours paper in Physiography.'**

CHEMISTRY NOTES.

BY THOMAS CARTWRIGHT, B.A., B.SC. (LOND.),

First Class Honoursman in Chemistry (Science and Art Department), Head Master, Finchley Organised Science School, and Lecturer therein on Chemistry.

The action of Mg on Cupric Sulphate Solution.—Dr. Clowes and Mr. Coven, B.Sc., contributed a paper on this subject to the Chemical Society at a recent meeting. They examined the action of Mg in solution of $CuSO_4$ of different strengths, both at atmospheric temperature and at a temperature near their boiling point. They find that the evolution of H, which always takes place, is accompanied by the precipitation of a mixture of **cupric oxide and metallic copper** in proportions which vary with the conditions of the experiment.

When a dilute solution of $CuSO_4$ is employed, the above-mentioned products are accompanied by **a quantity of a green substance,** which consists of a mixture of basic hydrated sulphates of Cu and Mg. This substance was observed to form when a saturated solution of $CuSO_4$ was employed, but it was decomposed again before the reaction was completed.

The time of the reaction varies from **ten minutes,** in the case of a **hot strong solution** of $CuSO_4$, to several days or even a week when a dilute solution is employed at atmospheric temperature.

The quantities of the three reduction products, cuprous oxide, copper, and hydrogen, were determined under various conditions. A volumetric process depending upon the use of potassium permanganate was employed for the estimation of the cuprous compound when it occurred, together with the basic sulphate of copper and magnesium before mentioned.

The authors found in each case that they investigated that the sum of the Mg equivalents of the cuprous oxide, copper, and hydrogen, agrees very closely with the amount of Mg employed in the experiment. The Mg is therefore proved to have displaced from the solution of $CuSO_4$, substances which are chemically equivalent to it, though only a small and variable proportion of these substances consists of metallic copper. The authors have shown that the nature of the reaction is not influenced by the presence of slight impurities in the cupric sulphate employed by carrying out similar experiments with a specimen of the salt obtained by six successive recrystallisations of a sample which was originally almost pure. Pickering's observation of the formation of a basic sulphate of copper by the decomposition of a solution of cupric sulphate by boiling has been incidentally confirmed, but the formula which the authors attribute to this compound is $4CuSO_4 7Cu(OH)_2, H_2O$.

The authors have referred to the paper by Commaille, and they find that an equation is given which is supposed to represent the reaction between Mg and $CuSO_4$ solution. This equation, when it is put into modern form and corrected for an obvious error, reads as follows:—

$$6CuSO_4 + 5Mg + 3H_2O = 5MgSO_4 + (3CuO, SO_3) + Cu_2O + Cu + 3H_2.$$

No details are given as to the temperature or the strength of the $CuSO_4$ solution which acted on the Mg, nor are the analytical data given upon which the above equation is founded.

It will be noticed that the formation of basic Mg compounds is not accounted for in the above equations. The authors consider that the results of their own analysis and examination prove that the composition of the basic sulphate of Cu is variable, but that it does not correspond to the above formula, and certainly occurs in the form of hydroxysulphate. They have never found that the proportion between the quantities of cuprous oxide and metallic copper is such as can be definitely represented by means of an equation, but rather that it varies within wide limits under different experimental conditions.

The authors desire to place on record the fact that when **Zn acts upon a cold solution of $CuSO_4$** small bubbles of gas are evolved; and that when a hot solution of $CuSO_4$ is employed, an appreciable quantity of H can be collected, and cuprous oxide is found in the residue. They intend to study this reaction in detail.

Professor Tilden's Opinion.—First there is a precipitation of spongy metallic Cu, which in contact with the Mg gives a compound capable of decomposing water at common temperatures. H is then evolved, and a crust of MgO formed on the surface of the metal. The copper salt is locally reduced by the H to the cuprous state, and this, in the presence of the magnesium oxide, led to the precipitation of cuprous oxide and of a basic cupric salt. The green precipitate forms therefore consists of MgO and basic cupric salt, the properties varying according to the temperature and strength of the solution.

Professor Clowes' Reply.—The origin of the investigation dated back some two years, the irregular action of Mg on $CuSO_4$ solution having been noticed in the course of experiments made in connection with a laboratory curriculum, which he was then drafting for elementary students. It was anticipated that the reaction of Mg on $CuSo_4$ solution might serve to establish the relative chemical values of Cu and Mg, **but this was found to be impracticable owing** to the evolution of a large amount of H. **'If such irregular actions occurred, instead of the simple replacement of one metal by another in solutions of its salts, it would seem that this method of determining chemical equivalents was not of general application.'**

It is because of the mortification that has been caused to so many students and teachers by the above experiment that this long article has been given. It is rather remarkable, to say the least of it, that the Science and Art Department should have given such an unreliable test as the above at the last examination for the elementary stage of Xp.

The densities of CO, CO_2, and N_2O.—Lord Rayleigh has an important paper on the above subject in the *Chemical News* for December 31st. It is much too long for insertion here, and cannot well be abbreviated.

Reaction of Hydrogen upon H_2SO_4.—M. Bertholet finds that there is an important reaction between these two bodies. He placed ·5 grms. of boiled H_2SO_4 in a sealed tube with 11 cc. H; at the end of six hours at a temperature of 250° all the H was absorbed, with the production of water and sulphurous acid. The reaction takes place also at ordinary temperature, but is much slower; it does not occur with dilute acid, and the light has no appreciable effect upon it.

Direct Reaction of H_2SO_4 with Hg at ordinary temperatures.—M. Bertholet states that boiled H_2SO_4 has a slow action on Hg, forming a sulphate, and giving off sulphurous acid when carbonic acid is passed through it. Reactions described in this paper can only take place when the H_2SO_4 is at the maximum of condensation.

Action of Water on PCl_3 and $POCl_3$.—The reaction between PCl_3 and H_2O in excess gives phosphorous acid and HCl; but when the trichloride is in excess, says M. Besson, several peculiarities are observed. No matter how we arrange for the reactions between a small quantity of H_2O and PCl_3 we always find a small quantity of a phosphorous oxychloride resulting from the incomplete reaction $PCl_3 + H_2O = 2\,HCl + POCl$. This latter is a solid body of the consistence of paraffin, with a smell similar to that of phosphoric oxychloride or chloride of phosphoryl, $POCl_3$. This body is insoluble in the usual solvents, and is analogous in the phosphoric series to NOCl, AsOCl, etc.

Production of strontium sulphide by means of H_2S and strontia or carbonate of strontium. The author—J. R. Mourelo—found that temperature had a curious influence on the results in the carrying out of this process. A porcelain tube containing either strontia or carbonate of strontium is placed in a furnace, and H_2S is passed over it, at first, in the cold. The tube is then gradually warmed to a bright red heat, taking care that the current of gas is strong enough to carry off the water formed by the reaction. When the transformation is complete, a slow current of dry H is substituted for the H_2S; after this the tube is allowed to cool and the contents, monosulphide of strontium, may be withdrawn; this sulphide is not phosphorescent. At a red heat the formula of the reaction is

$$H_2S + SrO = SrS + H_2O.$$

If the temperature is not sufficiently high, the water condenses in the tube and attacks the sulphide already formed, and a mass has been found containing 221° of strontic hydrate and smelling strongly of H_2S.

Asbestos.—In the *Chemical News* for January 7th, Mr. H. Jervis has some useful laboratory notes on the use of asbestos. The article is too lengthy for reproduction.

Preparation of Carbides by the action of Calcium Carbide on the Oxides.—M. Henri Moissan finds that besides the curious action on water, carbide of calcium acts as a powerful reducing agent, and, thanks to this property can furnish a number of new effects by double reaction, but **only when in contact with the body in a liquid state, or a state of fusion** at a sufficiently high temperature. In a state of fusion it acts energetically on the oxides, and if the metal will not unite with carbon—such as Pb, Su, Bi—it is set at liberty and can be separated or combined with other bodies, according to the condition of the experiment. If the water or metalloid is capable of being carbonised a double decomposition takes place, according to the formula

$$RO + CaC_2 = RnC + CaO$$

in which R represents the metal and n a variable number of atoms of C. By this method definite crystallised carbides of Al, Mu, Cr, Mo, Si, etc., have been prepared.

Commercial Preparation of Oxygen.—MM. Dutremblay and Lugan hope to reintroduce, with improved apparatus and methods, the process used by Tessié du Milay in 1867, but since abandoned. It consisted of decomposing by means of superheated steam at 500° the alkaline manganates, which are regenerated at the same temperature by a dry current of purified air. The apparatus required is an air pump, a purifier (to remove CO_2 and H_2O), a furnace for the manganates, an automatic distributor (to introduce alternately air and steam into the retort), and a gasholder furnished with a refrigerator to condense the watery vapour drawn in. The reactions take place at a low pressure, and as the oxygen is carried into the gasholder by means of the steam instead of this pump, it is kept perfectly free from carbides. The old disadvantages, which consisted in the caking of the charge and the evaporation of the soda, have been rectified and done away with, and there is now no longer any danger of explosion occurring.

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HEAT,

WITH SPECIAL REFERENCE TO ELEMENTARY THERMODYNAMICS.

BY EDWIN EDSER, A.R.C.S., F.PH.S.

THE book recommended for this course is Draper's 'Heat,' unless, indeed, the student has access to Preston's work on the same subject. It will be assumed that the student is acquainted with the ordinary elementary experimental phenomena connected with heat, together with their explanation. In these pages some of the most important principles in connection with Thermodynamics and the Kinetic Theory of gases will be systematically developed in a manner as simple as possible, experience having shown that it is in this part of the subject that elementary students find the greatest difficulties.

The student is supposed to be well acquainted with Boyle's law, together with the experimental methods employed in deriving and verifying it. We are not at this present moment concerned with the deviations from this law, which many gases exhibit when subjected to pressure; our first object is to account, on dynamical principles, for the relation $p\,v$ = constant; where p is the pressure of the gas, and v its corresponding volume, the temperature of the gas being supposed constant.

Chemistry has taught us that gases must be considered to be composed of molecules, the number of molecules, at a given temperature and pressure, per unit volume being constant, whatever may be the nature of the gas (Avogadro's Law). Let us now further suppose that these molecules of a gas are moving about amongst each other with great velocities. Collisions will continually be taking place, the average number of collisions per second experienced by a single molecule depending on the number of molecules per unit volume. The average distance that a molecule moves between two encounters is called the *Mean Free Path* of the molecule. It will further be supposed, for the present, that the diameter of a molecule is small in comparison with its mean free path. Let us suppose that we have gas, at a pressure p, contained in a cubical vessel, each side of which is one centimetre in length. Then since pressure is measured in dynes per square centimetre, the force exerted on either of the six faces of the cube will be equal to the pressure of the gas. Molecules will of course be constantly striking against the walls of the containing vessels, and our first object is to determine whether, by means of these impacts, we can account for the pressure exerted by the gas.

Let there be n molecules within the unit cube. Then each molecule may be imagined as vibrating in a small cube, whose volume $= \frac{1}{n}$ c.c., each side consequently being $\left(\frac{1}{n}\right)^{\frac{1}{3}}$ cm. in length. As a matter of fact each molecule is continually moving from one part of the gas to another; but no error is introduced by the supposition made above, since if at any moment one molecule moves out of its 'vibration cube,' another molecule will, on the average, move in at the same time and take its place. Since the area of the face of one of these vibration cubes will be $\left(\frac{1}{n}\right)^{\frac{2}{3}}$ sq. c.m., the number of these cubes lying against a face of the centimetre cube will be $n^{\frac{2}{3}}$. This set of vibration cubes will of course contain $n^{\frac{2}{3}}$ molecules.

Let v be the velocity, perpendicular to a certain face of the containing vessel of a particular molecule. Then between each impact on the walls of the containing vessel and the succeeding one, the molecule must have travelled twice the distance between the opposite faces of the vibration cube, *i.e.*, $2\left(\frac{1}{n}\right)^{\frac{1}{3}}$. Hence the number of times that a particular molecule will strike the face of the containing vessel $= v \div 2\left(\frac{1}{n}\right)^{\frac{1}{3}} = \frac{v}{2}\,n^{\frac{1}{3}}$.

Now the molecule under consideration will approach the wall of the containing vessel with a velocity v, and rebound with an equal velocity in the opposite direction. Let m be the mass of the molecule. Then the alteration of momentum of this molecule per second due to impacts against the wall of the containing vessel will be equal to

$$m \times 2v \times \frac{v}{2}\,n^{\frac{1}{3}} = mn^{\frac{1}{3}}v^2.$$

Let v^2 be the average value of the square of the component velocity of the gas molecules, perpendicular to the particular face of the containing vessel under consideration. Then the $n^{\frac{1}{3}}$ molecules which are continually striking against the face of the cube, will experience an alteration of momentum equal to

$$n^{\frac{1}{3}} \times mn^{\frac{1}{3}}v^2 = mn\,v^2 \text{ per second.}$$

But since this alteration of momentum is brought about by impacts on the wall of the containing vessel, and action and reaction are equal and opposite, the effect on the wall is equivalent to an uniform force of mnv^2 dynes per sq. centimetre.

We have heretofore only considered that component of the molecular velocity perpendicular to a particular face of the centimetre cube. Let $\bar{w}^2$ and $\bar{u}^2$ be the mean of the squares of the molecular velocities in any two mutually rectangular directions both perpendicular to v. Then $\bar{u}^2 + \bar{v}^2 + \bar{w}^2$ will be equal to the mean square of the *actual* molecular velocity.

Call this $\bar{V}^2$. Then

$$\bar{u}^2 + \bar{v}^2 + \bar{w}^2 = \bar{V}^2.$$

But since as many molecules will be moving in any particular direction as in any other direction,

$$u^2 = \bar{v}^2 = \bar{w}^2. \quad \text{Hence } \bar{v}^2 = \frac{\bar{V}^2}{3}.$$

$$\therefore \text{ pressure } = \tfrac{1}{3}mn\bar{V}^2.$$

The student should notice that we have been dealing with the average of the square (or the *mean square*) of the molecular velocities. A moment's consideration will convince him of the necessity of this treatment. For since the molecules are moving indifferently in all directions, of those moving *parallel* to any given straight line, as many will be moving in *one direction* as in the *opposite*. Hence the mean of the molecular *velocities* will be zero. On the other hand, the square of the velocity is an essentially positive quantity, and the mean of the squares of the various molecular velocities has therefore a definite value.

Next note that $m\,n$ = mass of molecules contained in one cubic centimetre of the gas, *i.e.*, $m\,n$ = the *density* D of the gas. Hence

$$p = \tfrac{1}{3}\,\mathrm{D}\bar{V}^2 \quad . \quad . \quad . \quad . \quad . \quad . \quad (1).$$

Now suppose that we are dealing with a containing vessel of any size whatever. Since the pressure is equal to the force per sq. cm. on the bounding wall, the above result will still apply. Also, if we alter the volume of the vessel, the density will vary inversely as the volume (density = mass per unit volume = $\frac{\mathrm{M}}{v}$ whence M is the total mass of the contained gas, and v is the volume of the containing vessel). Hence

$$p = \tfrac{1}{3}\,\frac{\mathrm{M}}{v}\,\bar{V}^2.$$

$$\therefore pv = \tfrac{1}{3}\,\mathrm{M}\bar{V}^2 \quad . \quad . \quad . \quad . \quad (2).$$

Now M is necessarily constant; therefore if $\bar{V}^2$ is also constant, pv will be constant. It is assumed that $\bar{V}^2$ is constant as long as the temperature remains unaltered; on this supposition Boyle's Law may be considered to be fully explained.

Problem.—Determine the Mean Square of the velocity at 0° C. for Hydrogen, Oxygen, and Nitrogen respectively.

Answer.—1 Litre (1,000 c.c.) of Hydrogen has a mass of ·0896 grs., when the barometer stands at 76° cm., and the temperature is 0° C. Take the density of mercury as 13·6 grs. per c.c., and g the acceleration due to gravity, as 981 dynes per grm.

Then $p = 76 \times 13{\cdot}6 \times 981 = 1014000$ dynes per sq. cm.

$$\therefore (1{\cdot}014 \times 10^6) \times 10^3 = \tfrac{1}{3} \times {\cdot}0896 \times \bar{V}^2 \text{ from (2).}$$

$$\therefore \bar{V}^2 = 3{\cdot}39 \times 10^{10}.$$

$\therefore$ for Hydrogen $\bar{V}$ = 184000 cm. per second approximately.

This means that if we could see the Hydrogen molecules they would, on an average, be moving between their encounters with a velocity of $1{\cdot}84 \times 10^5$ cm. per second.

By the help of Avogadro's Laws, the value of $\bar{V}^2$ and $\bar{V}$ may be calculated for Oxygen and Nitrogen. V will be found to be equal to 46100 cm. per sec. for Oxygen and 49200 cm. per second for Nitrogen.

The student who has mastered the above results, and satisfied himself as to the legitimacy of each step in the above argument, has made a most important advance in the study of heat. A little reflection will show him that many phenomena are now capable of exact explanation, which he was formerly only able to account for qualitatively. For instance, it has been established experimentally that the rates at which gases diffuse are inversely as the square root of their densities. The density of Hydrogen being 1, Oxygen 16, this would mean that Hydrogen diffuses four times as quickly as Oxygen. From the above example $\frac{1}{4}$ is seen to be the ratio of the average velocities of Oxygen and Hydrogen.

Further, when any quantities of two different gases are enclosed in a vessel, the total pressure exerted on the walls of the vessel has been found to be equal to the sum of the pressures that the gases would separately exert if contained by the vessel. The reason of this fact is obvious according to the above theory.

Perhaps the most important point to notice in connection with (2), is that $\bar{V}^2$ will vary with the temperature. Now $\frac{1}{2}\,\mathrm{M}\bar{V}^2$ is the kinetic energy due to the molecular motion of the gas; hence an increase of temperature increases the kinetic energy due to the vibrations of the molecules, *i.e.*, the higher the temperature the faster will the molecules be moving. Hence temperature may be considered simply as a manifestation of the kinetic energy of molecular motion of the gas. The question then naturally arises, what should be the temperature of a substance the molecules of which possess no kinetic energy, and therefore no motion? Evidently the kinetic energy of the substance (an essentially positive quantity) could not be further diminished; therefore we should look for an absolute zero of temperature. As we progress we shall have abundant opportunities of examining whether this is a legitimate assumption or no; it is sufficient here to state that a variety of trains of reasoning lead us inevitably, not only to conclude that an absolute zero exists, but to numerical values for the difference of temperature between this zero and known standard temperatures (such as that of melting ice) which are in almost exact agreement.

NOTES ON THEORETICAL MECHANICS

BY F. CASTLE, M.I.M.E.,

Royal College of Science; Lecturer on Mechanics, Geometry, etc., Morley College, London.

ADVANCED AND HONOURS STAGES.

(*Continued from page* 445.)

Centre of Percussion.—If a bar be suspended from a knife-edge passing through one end, and be made to vibrate, the length of an equivalent simple pendulum vibrating in the same time can be determined, and will give a point along the bar called the *centre of oscillation*, such that when the pendulum is inverted and made to vibrate about that centre, the time of vibration is the same as before. The centre of oscillation is also the *centre of percussion*. It has the property that any blow or push delivered to the body in the plane of its swing may set it swinging or stop the swing, but will *not* produce any force on the supports.

If x denote the distance of the centre of percussion from the axis, then, since

$$\mathrm{M}k^2 = \frac{\mathrm{M}l^2}{3},$$

$$\therefore k^2 = \frac{l^2}{3}.$$

$$\text{Also } x = \frac{k^2}{l} = \frac{2}{3}l.$$

Thus the centre of percussion is at a point two-thirds the length of the rod from one end.

An experimental verification is easily made by making at or about the middle of a uniform bar or rod a fairly stiff hinged joint, and suspending the bar in a horizontal position by an axle passing through one end. When struck upon an anvil placed anywhere except at the centre of percussion, the bar will be bent; but when the anvil is placed under the centre of percussion, the bar when struck remains unaltered in shape.

Ex. 1. Define the centre of percussion, and find its position from first principles in the case of a rod of uniform density suspended freely from one end. (1891.)

(Ans. $\frac{2}{3}l$, where l = length of rod.)

Ex. 2. Define the moment of inertia of a system of particles. Find the moment of inertia of a rod of uniform density, with reference to an axis passing through one end at right angles to its length.

A rod 6 ft. long, weighing 12 lbs., revolves uniformly 30 times a minute about an axis at right angles to its length and passing through one end. Find its kinetic energy. (1887.)

$$\left(\omega = \frac{2\pi \times 30}{60} = \pi. \quad \mathrm{KE} = \tfrac{1}{3}\mathrm{M}l^2\omega^2 = \tfrac{1}{3} \times 12 \times \frac{36}{3} \times \pi^2 = 72\pi^2\right).$$

Ex. 3. Define the moment of inertia of a body or system of particles. (*a*) Find the moment of inertia of a straight line of uniform density with respect to one end.

A fine wire of uniform density is bent into the form of the perimetre of a square; find its moment of inertia (*b*) about an axis joining the middle points of two opposite sides of the square; (*c*) about an axis passing at right angles to the plane of the square through its middle point; (*d*) about a diagonal of the square. (1884.)

Ans. (*a*) $\frac{1}{3}Ml^2$, where M = mass, l = length.

(*b*) Let a = side of a square and m the mass of each side.

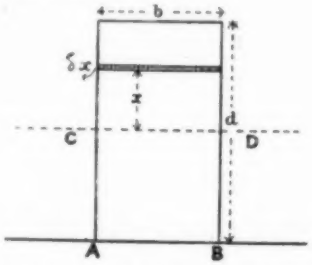
Then $l = 4a$ and $M = 4m$.

$$I = \tfrac{2}{3}ma^2 = \tfrac{1}{12}Ml^2.$$

(*c*) $I = \frac{1}{2}ma^2 = \frac{1}{8}Ml^2$.

(*d*) $I = \frac{2}{3}ma^2 = \frac{1}{12}Ml^2$.

Moment of inertia of the area of a rectangle about a line or axis passing through the centre of gravity.



Let b denote the width, and d the depth of the rectangle.

If we consider any elementary area of width b, and thickness δx, at a distance x_1 from the axis, its moment of inertia about that axis is $b\delta x \times x_1^2$. It follows at once that as the moment of inertia of any elementary area involves the square of its distance from the axis, therefore it is immaterial whether the distance be positive or negative.

Thus the moment of inertia of the part above the axis is

$$b\left\{x_1^2\delta x + x_2^2.\delta x + \ldots\ldots \left(\frac{d}{2}\right)^2\delta x\right\}.$$

A similar sum would be obtained for the lower part. Hence

$$I = 2b\left\{x_1^2\delta x + x_2^2\delta x + \ldots\ldots \left(\frac{d}{2}\right)^2\delta x\right\}.$$

As in the case of a uniform rod, we can proceed to build up a pyramid, the volume of which will give the summation required; $\therefore$ the base of the pyramid would be a square of edge $\left(\frac{d}{2}\right)$ and length of axis also $\frac{d}{2}$, the volume of the pyramid is

$$\frac{1}{3}\left(\frac{d}{2}\right)^2 \times \frac{d}{2} = \frac{1}{24}d^3;$$

multiplying this by $2b$ we obtain $I = \frac{1}{12}bd^3$.

Using the calculus, the number of strips is assumed to be infinite; the thickness of each is denoted by dx.

Moment of inertia of strip at distance x from axis is then $b.dx \times x^2$.

$$\therefore = b\int_{-\frac{d}{2}}^{\frac{d}{2}} x^2dx.$$

As before, the summation indicated by

$$\int x^2dx \text{ is } \frac{x^3}{3} + C.$$

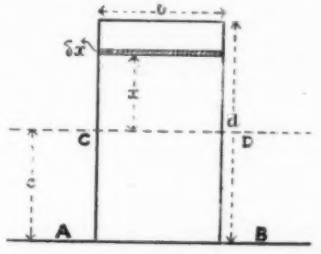
Using this and substituting for x the limits $\frac{d}{2}$ and $-\frac{d}{2}$ we obtain

$$\frac{1}{3}\left(\frac{d}{2}\right)^3 - \frac{1}{3}\left(-\frac{d}{2}\right)^3 = \frac{d^3}{24} + \frac{d^3}{24} = \frac{d^3}{12}.$$

$$\text{Hence } I = \frac{bd^3}{12}.$$

The moment of inertia of any area about any line is equal to the moment of inertia about a parallel line through its centre of gravity, together with the product of the area into the square of the perpendicular distance between the lines, or $I = I_0 + A \times C^2$, where I denotes the moment of inertia of the area about the line, I_0 denotes the moment of inertia about a parallel line through its centre of gravity, C = perpendicular distance between the lines.

The above proposition is of the utmost importance. To show its application we can find the moment of inertia of a rectangle (sides b and d) about the edge AB.



Let the distance of any strip (of width b and thickness δx) from CD be x, and from AB be $x + c$.

Moment of inertia of strip about axis AB

$$= b.\delta x \times (x + c)^2$$
$$= b.\delta x\,(x^2 + 2xc + c^2).$$
$$\therefore I = b\Sigma x^2\delta x + 2b\Sigma xc.\delta x + b\Sigma c^2\delta x$$
$$= b\Sigma x^2.\delta x + 2bc\Sigma x.\delta x + c^2\Sigma b.\delta x.$$

Now, $b\Sigma x^2\delta x = I_0$.

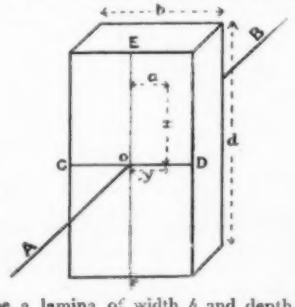
Also, $\Sigma x.\delta x = o$, since axis passes through the centre of gravity.

And $c^2\Sigma b.\delta x$ is the square of the distance into the area of the rectangle.

$$\text{Hence } I = I_0 \times A + \left(\frac{d}{2}\right)^2$$
$$= \frac{1}{12}bd^3 + (b \times d) \times \frac{d^2}{4}$$
$$= \frac{1}{3}bd^3.$$

As an exercise, show that if the moment of inertia of a rod about its centre of gravity is given by $\frac{Ml^2}{12}$, its I about one end $= \frac{Ml^2}{3}$.

The moments of inertia of a lamina about two axes in its plane at right angles to each other being known; to find the moment of inertia about an axis at right angles to its plane, and passing through the point of intersection of the other two axes.



Let CFDE be a lamina of width b and depth d, the two axes being CD and EF. The moment of inertia of any elementary area a about the axis CD would be mass of $a \times x^2$, and about the axis EF would be mass $\times y^2$. Hence, moment of inertia about o, the point of intersection of the two axes, would be mass $\times r^2$ = mass $(x^2 + y^2)$.

The moment of inertia of the lamina about axis CD is $\frac{1}{12}bd^3$, and if m denote the mass of unit volume, then $M = m \times b \times d$. Hence, $I = \frac{1}{12}Md^2$.

In a similar manner for the axis EF we have $I = \frac{1}{12}Mb^2$.

Hence, moment of inertia for an axis AB at right angles to the plane of the other two would be $\frac{1}{12}M(b^2 + d^2)$.

Ex. 4. If the moment of inertia of a body with reference to an axis passing through the centre of gravity is known, how can the moment of inertia be found with respect to a parallel axis? (1893.)

Ex. 5. The moments of inertia of a lamina about two axes in its plane at right angles to each other are known; state and prove the rule by which we can infer its moment of inertia about an axis at right angles to its plane passing through the point of intersection of the other two axes.

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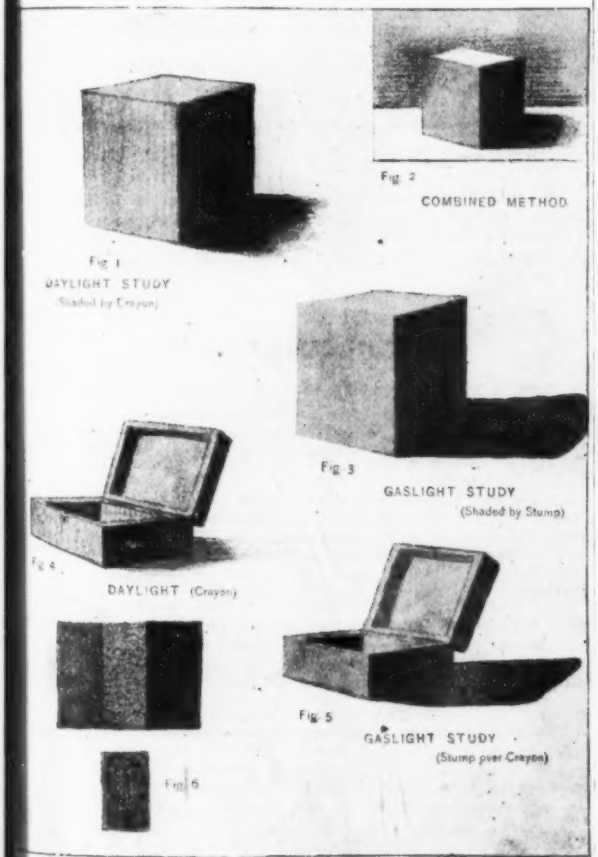

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A wire of uniform density is bent into the form of the circumference of a circle; its moment of inertia about an axis at right angles to its plane and passing through its centre is, plainly, mass × (radius)²; infer its moment of inertia about any axis in its plane. (1881.)

Ans. $\frac{1}{2}Mr^2 + Mc^2$ (where c = distance of the axis from the centre).

Ex. 6. Find the moment of inertia of a rectangular lamina about an edge.

A rectangular lamina, whose shorter edges are 4 ft. long, turns round one of its longer edges 50 times a minute; it weighs 441 lbs. Find its kinetic energy (*a*) in foot poundals, (*b*) in foot pounds. (1888.)

Ans. (*a*) 3266·7, (*b*) $\frac{3266\cdot7}{g}$.

Ex. 7. The sides of a rectangle are a and b; find the moment of inertia about the side a of a diagonal considered as a line of uniform density. (1894.) Ans. $\frac{1}{3}Mb^2$.

Ex. 8. Define the moment of inertia of a body with respect to a given axis.

The moment of inertia of a uniform rod with respect to an axis passing through one end at right angles to its length is $\frac{1}{3}$ (mass) × (length)²; show that when a uniform rod coincides with one edge of a cube, its moment of inertia with respect to another edge which neither meets nor is parallel to that edge, is $\frac{4}{3}$ (mass) × (length)². (1880.)

Ex. 9. Find the moment of inertia of a square lamina of uniform density about an axis at right angles to its plane through its middle point.

If one face of a cube is a lamina of uniform density, find its moment of inertia about a diagonal of the opposite face. (1894.)

MATHEMATICS.

STAGES 2 AND 3, SCIENCE AND ART DEPARTMENT.

BY G. A. BAXANDALL,
Mathematical Division, Royal College of Science, London, and Lecturer on Theoretical Mechanics, City of London College.

(*Continued from page* 443.)

STAGE 2.

Trigonometry.

We hope that no student has any difficulty in obtaining the value of the sine, cosine, or tangent of any angle whatever, greater or less than 90°. He should understand that the values are given in a book of tables,* for angles between 0° and 45° (it is not necessary to give them for other angles). Being in possession, then, of such tables, it is an easy matter to find the value of, say, 268°, for it can be seen by means of a figure that sin 268° is the same in *amount* as sin 88°, but that it is *negative*.

Example.—If we are told that 12 sin $\theta = 7$, then sin $\theta = 7 \div 12 = \cdot5833$. Now if we are further told that sin 35° 41′ = ·5833 we infer that θ must be 35° 41′. Or rather we ought to say that θ *may be* 35° 41′, or that the *least positive* value of θ is 35° 41′. Satisfy yourself by means of a figure that θ may also be 144° 19′, 395° 41′, 504° 19′, and so on.

Again, if we have given that 5 tan²3θ = 17, we say tan 3θ = $\sqrt{17 \div 5} = 1\cdot844$. Now if we were further told that tan 61° 33′ = 1·844, we should know that 3θ = 61° 33′, or, 241° 33′, or 421° 33′, and so on; therefore θ = 20° 31′, or 80° 31′, or 140° 31′, and so on.

We ought also to take −1·844, we should then obtain other angles.

If you had a book of tables you might make up many examples like this for yourself and work them out.

Work the following:—

1. Given that 12 cos θ − 5 = 0, and that cos 65° 24′ = ·4167, find the three least values of θ.

Ans. 65°24′; 294° 36′; 425° 24′.

2. Given that 141 tan²x = 8, and that tan 13° 24′ = ·2382, show that the four least positive values of x are 13° 24′, 166° 36′, 193° 24′, 346° 36′.

3. If 8 sin 2θ = 5, and sin 38° 41′ = ·6250, show that the values of θ less than 4 right angles are 19° 20′ 30″, 70° 39′ 30″, 199° 20′ 30″, and 259° 39′ 30″.

4. If in the last example we had 8 sin 2θ + 5 = 0, show that the answers would have been 109° 20′ 30″, 160° 39′ 30″, 289° 20′ 30″, 340° 39′ 30″.

5. Find, by using a book of tables, the values of sine, cosine, and tangent of 28°, 142°, 238°, 352°.

In the next two examples, ABC is a triangle right-angled at C.

6. Given that A = 35° and AB = 16 feet; also that sin 35° = ·5736, cos 35° = ·8192, find BC and AC.

Ans. 9·178 ft., 13·11 ft.

7. Given that AB = 20, BC = 12, find AC. Also find A if cos 41° 24′ = ·7500.

We should like the student to realise that it would be a far better exercise for him if he possessed a book of tables. It would then be unnecessary for us to give such information as that cos 41° 24′ = ·7500.

Learn and be able to prove the relations on p. 55 'Hamblin Smith,' or Art. 108, 'Lock,' or Art. 27, 'Loney,' and observe that after all, each of the equations sin²A + cos²A = 1, 1 + tan²A = sec²A, 1 + cot²A = cosec²A, is only another way of stating Prop. 47, Book I.

Work out some of the examples on p. 57 H.S.; or p. 71 'Lock,' or p. 24 'Loney.'

STAGE 3.

Trigonometry.

Error in December Number.—In the Example which was worked out tan a should be $\frac{3}{2}$ instead of $\frac{2}{3}$: this of course caused the answer to be wrong.

Some properties of a triangle—

1. Know, and be able to establish the formulæ for the area of a triangle or regular polygon.

2. Know, and be able to establish the formulæ for the radii of the inscribed and circumscribed circles of a given triangle or regular polygon, and for the 3 escribed circles of a given triangle. In working exercises on these be ready to use the formulæ for

$$\sin\frac{A}{2},\ \cos\frac{A}{2},\ \tan\frac{A}{2}.$$

3. If D, E, F are the feet of perpendiculars drawn from the corners A, B, C, of a triangle, on to the opposite sides (please supply a figure), be able to write down, in terms of a side and angle, expressions for AD, BE, CF, BD; also for any side (or angle), say ED, of the *pedal* triangle DEF.

4. In the case of the escribed and inscribed circles of a triangle, be able to write down the lengths of a line drawn from the centre of any such circle to any angular point of the triangle. Also for such a line be able to write down the length of its projection on either of those sides of the triangle which meet in the angular point to which the line was drawn.

You will find most of these worked out in any text-book of trigonometry, or in 'PRACTICAL TEACHER,' *April* 1896. It would be a far better exercise to try (3) and (4) without referring to a text-book.

Area of a quadrilateral.—Observe that to be merely given the sides of a quadrilateral, is *not* sufficient to construct it (or find its area), for there are many quadrilaterals satisfying such data. If the sum of two opposite angles be given, in addition to each side, it is possible to find an expression for its area, namely,

$$\sqrt{(s-a)(s-b)(s-c)(s-d) - abcd\cos^2\alpha},$$

where α is half the sum of a pair of opposite sides.

If however the quadrilateral be such that a circle can be circumscribed about it, $\alpha = 90°$ and the term $abcd\cos^2\alpha$ is zero. Or if a circle can be inscribed in it, $a + c = b + d$, and above formula reduces to $\sqrt{abcd}\sin\alpha$.

Work examples on the above from your text-book.

We append the following, selected from the Stage 3 Papers of 1897. Solutions to any of these will be given next month if a request be made to the Editor.

1. If the rectangle under the diameter of the inscribed circle and the diameter of one of the escribed circles equals the rectangle under the diameters of the other two escribed circles, show that one angle of the triangle is a right angle.

2. Show that $r = 4R\sin\frac{1}{2}A \cdot \sin\frac{1}{2}B \cdot \sin\frac{1}{2}C$.

3. Show that the area of ABC is to the area of the circle touching BC and the other two sides produced, in the ratio $\cot\frac{1}{2}A \cdot \tan\frac{1}{2}B \tan\frac{1}{2}C : \pi$.

4. P is a point inside a triangle ABC, and p, q, r are the lengths of the perpendiculars PD, PE, PF drawn from P to BC, CA, AB respectively; show that

$$\frac{\sin(A+D)}{p} + \frac{\sin(B-D)}{q} + \frac{\sin(C-D)}{r} = \frac{p}{qr}\sin D,$$

where D is the angle EDF.

* 'Bottomley's Logarithmic and Trigonometrical Tables,' published by William Collins, Sons & Co., is a useful book. This or a similar one should be possessed by every student of Mathematics.

SCIENCE QUERIES, &c., are unavoidably held over. Printed replies may be had upon application to the Editor.

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OUR COMPETITION PAGE

FRENCH COMPETITION.

Prize Editor:

W. T. THOMPSON, B.A. (LOND.),
FRENCH AND GERMAN HONOURS.

RULES AS LAST MONTH.

RESULT OF THE FEBRUARY COMPETITION.

The prize is awarded to '*C.E.M.*,' the pseudonym of Miss Montizambert, The Grove, Dumboyne, Co. Meath, Ireland.

First Class.—Paper-knife, Traddles, Echo, Couleur verte, Norwood, Agaznog, Caniculus, Meric, Nortoniensis, Cluny Brae, Mona, Clyde, Gretchen, Docendo discimus, Passepartout, Georgie, Westward Ho, Alifer, Old Lamp.

Second Class.—Dies, Tadpole, Berthe, Day Dawn, Zero, Dorothy Varden, Bijou, Forward, Robin, Fitzroy, White Violet, ——, Kenfig Hill, Lac, Cherrie, Un nouveau venu, Treherbert, Satan, Hastings, E.S., Postage stamp, Kidnapped, L'abeille, Narcissus, Elsa, ——, Helm Crag, Beginner, Windermere, Novice, Moi-même, Fido, Laragh, Carissima, Constance, Philo, Susan, Balmoral, Cui bono?, Olga (1), Espérance (1), P.C.Q., Venture, Kirkby, Espérance (2), Impromptu, Anglaise, Patricia, Jane, Ricket, Indoctus, Domesticated, U.C.N.W., Mercia, Spes, Teuton (1), Bruyère, Largo, Midget, Zimbabwe, Perce-neige, Olga (2), Montpensier, Venus, Cato, Silly Suffolk, Dunelm, Nairnissmo, Charles, Nil desperandum, La Brousse, Marguerite, Princess Osra, Teuton (2), Flispa, Gargantua, Kish, Amor Vincit, Veronica, Hirondelle, Fleur de lys, Vera, Winsome, Mab, Ecrire.

Third Class.—Snowdrop, Rina, Ebernoe, Cynwyd, First Try, Rugby, Attempt, Hélas!, Quilp, Tiny, Meg, Pensées, La Clyde, Eléonore, Midnight, X.N., Nestor.

The blanks in the Second Class refer to candidates whose papers bore no pseudonym.

Prize Translation.

Engaged in criticism we find two sorts of critics—those who are inferior, and those who are superior, to the work under judgment. The former award praise or blame according to the measure of their capacity, parts, and powers, frequently out of innocence of heart, occasionally out of malice and envy. The latter (who are far the more numerous, rendering criticism at present the most talented department of literature) are tied to a profession usually beneath their merits by the fixed salary or fitting remuneration which forms the sole stable livelihood of literature, and leads to better things. Wherefore, being superior to the work which it is their mission to recommend or interdict to the public, they naturally care not to follow the author step by step, to pluck his feathers one by one, and to play the tiresome, inglorious part of a professor of rhetoric correcting a lower boy's exercise. Although the conceit of authors may find their crime unpardonable, the rest of us can understand how these critics, soaring above the book whose title they take to head their article, give us, with this title as theme, an improvised rendering of their own with special variations. Be it the 'Carnival of Venice' that they play, the performance is all their own, and the public soon sees the folly of bearing them ill will for this. C.E.M.

REPORT ON THE FRENCH COMPETITION FOR FEBRUARY.

The exigencies of space compel us to give only brief reports this month, and to leave out several points we should have liked to introduce. Owing mainly to the intrinsic difficulties of the piece the number in the First Class is much less this month. *Le genre littéraire* was translated by many as the 'literary style.' But an examination of the context would show that it refers to criticism as a class or department of literary work. No one gave a quite correct translation of *un professeur de rhétorique corrigeant le thème d'un élève de sixième*. Almost all translated it literally. Some made *élève de sixième* to mean 'a pupil six years old,' or 'a pupil sixteen years old.' One competitor rendered it 'a pupil of the 16th century.' *Rhétorique* is the name given to one of the highest forms in a French school of the first class, whilst, as the forms are numbered in an opposite way to our own, *un élève de sixième* means a pupil in a junior form. The whole phrase therefore means 'a master of an advanced form correcting the exercises of a junior boy.'

A Prize of One Guinea will be given for the best translation into English of the following extract :—

Presque toujours on a confondu l'état de nature avec l'état sauvage : de cette méprise il est arrivé qu'on s'est figuré que les sauvages n'avaient point de gouvernement, que chaque famille était simplement conduite par son chef ou par son père ; qu'une chasse ou une guerre réunissait occasionellement les familles dans un intérêt commun ; mais que, cet intérêt satisfait, les familles retournaient à leur isolement et à leur indépendance.

Ce sont là de notables erreurs. On retrouve parmi les sauvages le type de tous les gouvernements connus des peuples civilisés, depuis le despotisme jusqu'à la république, en passant par la monarchie limitée ou absolue, élective ou héréditaire.

L'erreur où l'on est tombé relativement à l'existence politique du gouvernement sauvage est d'autant plus singulière, que l'on aurait dû être éclairé par l'histoire des Grecs et des Romains : à la naissance de leur empire, ils avaient des institutions très-compliquées.

Les lois politiques naissent chez les hommes avant les lois civiles, qui sembleraient néanmoins devoir précéder les premières ; mais il est de fait que le *pouvoir* s'est réglé avant le *droit*, parce que les hommes ont besoin de se défendre contre l'arbitraire avant de fixer les rapports qu'ils ont entre eux. Les lois politiques naissent spontanément avec l'homme, et s'établissent sans antécédents ; on les rencontre chez les hordes les plus barbares. Les lois civiles, au contraire, se forment par les usages ; ce qui était une coutume religieuse pour un mariage, une naissance ou une mort, se transforme en loi par le laps de temps. CHATEAUBRIAND.

GERMAN COMPETITION.

RESULT OF THE FEBRUARY COMPETITION.

THE prize is awarded to '*Avoine*,' the pseudonym of Miss L. M. Wilkes, 227, Upland Road, East Dulwich, S.E.

First Class.—Watch-night, La Brousse, C.E.M., Integer, Die Biene, Friar Tuck, Grüne farbe, Martha Schlaffke, Girdleness, U.C.N.W., Clyde, Arbeit, Mehr Licht, E.S., Omega, Fitzroy, Laragh, Silly Suffolk, Honnet, Schottin, Elsa, Dai Ta-lung, Tadpole, Gretchen, Nil desperandum, Agaznog, Echo, Weimar, Lac, Mona, Day Dawn, Nairnissmo.

Second Class.—Achtzehn, Kenfig Hill, Dies, Walesisch, Westward Ho, Fuchsthurm, Leben Sie wohl! Assistant, Teuton, Kish, Edelweiss, Esperanza, Pupil Teacher, Snowdrop, Faust, Beginner, Ebor.

Third Class.—Adelphos, Hirondelle.

Prize Translation.

It was New Year's Eve. The New Year stood on the threshold of its life while the old one was wrapping itself wearily and languidly in a white snow-mantle, and was receding slowly into the past, out of the lap of which not a single hour, whether for joy or sorrow, can ever be given back.

It is only the very thoughtless who can take leave of the parting year with calm indifference, with no more regret than that with which we might close a book which has had no great interest for us, and for whose sequel we feel no curiosity at all.

The last hours of the year speak with an eloquence before which the most profound minds are silent, an eloquence which finds its way into our hearts, even when no other feelings seem to touch us ; they speak alike powerfully to the happy and the unhappy, dangling before the happy ones what the unhappy scarcely dared to hope ; they are mirrors in which every tear, every smile are all too faithfully and mercilesaly reflected ; they are a bond with which the parting year binds together hearts that were estranged ; a key which unlocks the lips to enable them to atone for past wrongs, to heal contentions, and to help them to whisper the sweet, stammering accents of love. AVOINE.

We have every reason to be pleased at the result of our first German Competition. Though given without previous notice, fifty-two competitors presented themselves, and the quality of the work was high.

It was inevitable that a somewhat large number of competitors should translate '*Es war Sylvesterabend*' as 'It was the eve of St. Sylvester's day.' This is, of course, not a translation into English, as it does not express to us the idea it would convey to a German.

Sonst jede is merely 'every other.' Some have translated *sonst* as 'otherwise,' 'under other conditions,' etc.

Jenen zurufend, etc., is a vague and somewhat difficult sentence, of which hardly anyone gave a correct rendering. It means 'cheering on the former with the prosperity which was still an object of hope to the latter.'

Können, in the last line, refers to all the verbs *sühnen, schlichten*, and *hervorstammeln*.

Das in *das sie Unrecht sühnen* should have been printed as the conjunction *dass*, but the misprint did not puzzle anyone.

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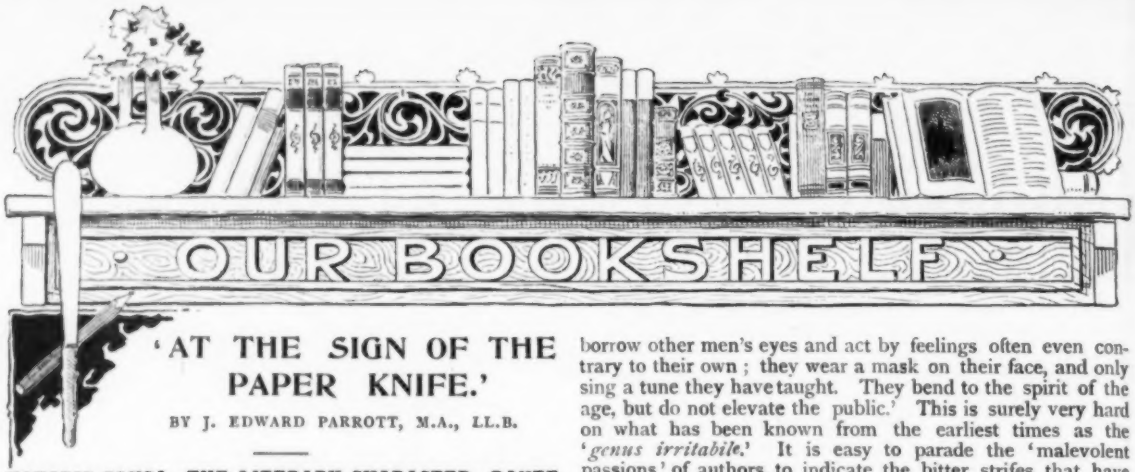

'AT THE SIGN OF THE PAPER KNIFE.'

BY J. EDWARD PARROTT, M.A., LL.B.

HONORIS CAUSA—THE LITERARY CHARACTER—DANTE AND THE PRIMARY TEACHER—THE VINTAGE—WESTWARD HO!

PERHAPS no profession has battened so exuberantly on the windy fare of platitude as our own. There is not a village prize-giving but the chairman solemnly asseverates that the teachers' calling is the noblest, or the next to the noblest, under heaven. A Prime Minister has assured us that we are 'the captains and guides of the New Democracy.' As a profession, we could collate for ourselves the most eloquent collection of testimonials extant. On the side of wordy appreciation we are satiated. But when we come to the outward and visible signs of these eulogia, the gilt is entirely off the gingerbread. I am not a Union speaker, or I should tell you precisely how many certificated men and women have to labour in the glorious calling for the remuneration of a scavenger. Their name is legion. I should tell you of educated men and women forced to hang precariously on the favours of village bullies, pompous ignoramuses, and parochial Pecksniffs, who labour to gall the teacher's lot and render his loftiest endeavours nugatory. Parliament, too, dawdles miserably with the Superannuation question, still content to link us in ignominious alliance with Spain and Turkey as the only European nations which deny the worn-out teacher a retiring provision.

* * * * *

Still, though we have good cause to grumble—and the teacher is not a bad hand at grumbling—there are occasions for taking heart of grace. A moment for real satisfaction comes when authorities of dignity and culture set themselves to recognise us by singling out representatives of our calling to wear the honours they have to bestow. When the University of St. Andrews conferred the title of Doctor of Laws on Mr. Heller there was not a primary teacher in the land who did not appreciate the gracious and delicate recognition thus conveyed. When Oxford—venerable, aristocratic, symbolic—selected Mr. Gray for adoption we felt a thrill of conscious pride. We forgot for a moment the contempt, the neglect, the suspicion to which we are too often subjected, and rejoiced that the Don in his lecture theatre should hold out the hand of fellowship to his fellow labourers working remotely and obscurely in humbler, but not less fruitful, spheres. And now, again, the news comes that the Senatus of St. Andrews has reiterated its appreciation by unanimously granting the LL.D. degree to the most popular leader in our Union, Mr. T. J. Macnamara, the editor of the *Schoolmaster*. No man amongst us deserves the dignity better. No man will wear it with a better grace. We congratulate Dr. Macnamara, and ourselves. To Professor Meiklejohn—*nomen clarum*—who proposed Mr. Macnamara's name and advanced his claims to the distinction, I beg leave to offer the cordial thanks of the profession. Professor Meiklejohn's services to education need no recital here. His books, informed with the mellow richness of the true scholar and illumined with the skill of the inspired teacher, are famous all the world over. St. Andrews to the primary teacher means Professor Meiklejohn. As a teacher of teachers Professor Meiklejohn has done much that the world of school and letters will not willingly let die.

'When literary men assemble together,' says D'Israeli in his discussion of the literary character, 'what mimetic friendships in their mutual corruption! Creatures of intrigue, they borrow other men's eyes and act by feelings often even contrary to their own; they wear a mask on their face, and only sing a tune they have taught. They bend to the spirit of the age, but do not elevate the public.' This is surely very hard on what has been known from the earliest times as the '*genus irritabile*.' It is easy to parade the 'malevolent passions' of authors, to indicate the bitter strifes that have sprung from sudden squabbles, neglects of petty civility, intrusions of unlucky epithets and casual unconsidered observations. But a volume could be easily compiled out of the generosities of literary men and women. Only that the world loves scandal better than benevolence, such a collection would be in existence. Perhaps the literary character has improved since D'Israeli wrote. Certain it is that no class is more conspicuously generous to-day. The crude and callow beginner who gratuitously unloads his lucubrations on the author of mark, with an appeal for perusal and advice, rarely receives even a curt reply. Too often weighty pens are checked and valuable time is sacrificed in the direction and encouragement or the kindly damnation of amateur effort. Do you find the eminent surgeon or the successful barrister eager to discover aspirants of promise and anxious to claim public recognition for future competitors? And yet who more impulsively generous than the writer on the look out for 'worth by poverty depressed'? No, it is true that *noblesse oblige* is the watchword of the aristocracy of letters to-day. If you want a modern instance wherewith to confound D'Israeli's jaundiced verdict, turn to the birthday letter which novelists, essayists, historians, poets, and philosophers have indited to one who does not 'sing a tune they have taught,' whose genius has never stooped to win the 'bubble reputation' of popular applause.

> 'For not on downy plumes, nor under shade
> Of canopy reposing, Fame is won:
> Without which, whosoe'er consumes his days,
> Leaveth such vestige of himself on earth
> As smoke in air, or foam upon the wave.'

* * * * *

TO GEORGE MEREDITH:

Some comrades in letters who have long valued your work send you a cordial greeting upon your seventieth birthday.

You have attained the first rank in literature, after many years of inadequate recognition. From first to last you have been true to yourself, and have always aimed at the highest mark. We are rejoiced to know that merits once perceived by only a few are now appreciated by a wide and steadily growing circle. We wish you many years of life, during which you may continue to do good work, cheered by the consciousness of good work already achieved, and encouraged by the certainty of a hearty welcome from many sympathetic readers.

(Signed) *J. M. Barrie, Walter Besant, Augustine Birrell, James Bryce, Austin Dobson, Conan Doyle, Edmund Gosse, R. B. Haldane, Thomas Hardy, Frederic Harrison, 'John Oliver Hobbes,' Henry James, R. C. Jebb, Andrew Lang, W. E. H. Lecky, M. Londin, F. W. Maitland, Alice Meynell, John Morley, F. W. H. Myers, James Payn, Frederick Pollock, Anne Thackeray Ritchie, Henry Sidgwick, Leslie Stephen, Algernon Charles Swinburne, Mary A. Ware, G. F. Watts, Theodore Watts-Dunton, Wolseley.*

* * * * *

Having just quoted Dante, and being a somewhat ardent student of the newspapers, I turn naturally to Mr. John Morley's recent deliverance on the opening of the Passmore-Edwards Settlement. 'People ask themselves,' said Mr. Morley in the course of his delightful address, 'what is the good of having lectures on Dante at the Passmore-Edwards Settle-

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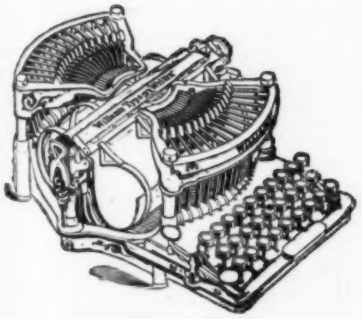

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ment? What has Dante to do with St. Pancras and the New Road? Well, Dante, no doubt, may have little to do with the immediate affairs of New Road or St. Pancras, but I submit this; that there is nothing now more important than that the teachers in the elementary and primary schools in this city should have a higher idea and a broader idea of what knowledge is. Most of their work is humble enough. It partakes too much perhaps of mechanism and drudgery, and I think no greater service could be rendered than that the teachers in the elementary schools should come to an institution of this kind, and should there find what sort of ideas great and giant minds held in the thirteenth century upon the self-same problems as those which exercise us to-day in the nineteenth. Depend upon it the Board School Teacher who hears a course of lectures upon Dante, or some other great historic or literary subject, has his mind expanded, vivified, enriched—his whole intellect quickened. His whole daily life in teaching assumes new significance in the light which the past throws upon the present. Then, I say, Dante has a great deal to do with St. Pancras and the New Road.' All this is very true and it would be presumption in me to attempt to add to it. In the past the course of our studies for the Department's diploma has been mainly non-literary. Indeed, many of us have been led to look on literature when weighed in the balance with science and mathematics, as a species of elegant trifling, and to despise it accordingly. Undoubtedly, we have suffered thereby. The greatest truths of life cannot be expressed in mathematical formulæ, nor can the finest fruits of culture spring from experimental science alone. The teacher whose mind is stored with the riches of a literature has the best instrument of refinement, illumination and inspiration ever at hand.

* * * * *

Leaving his 'Dodos' and 'Babe B.A.'s,' Mr. E. F. Benson has, at last, turned himself to worthy work, and in 'The Vintage' (Methuen & Co.) has wrought something which places him at a bound in the front rank of modern novelists. Dedicated to Olga, Queen of the Hellenes, Mr. Benson's fine romance deals with the regeneration of Greece, consequent on the fierce national upheaval of 1821. Mr. Benson is frankly no Turkophile, but his admiration for the Greek character does not blind him to the factious, mercenary and intriguing spirit that has unfortunately overlaid its inherent nobility in these latter days. The work is planned and executed in the grand manner. With the young giant Mitsos and the splendid patriot Nicholas we follow the whole course of the rising from the eve of the gathering to the treading of the blood-red grapes. The whole atmosphere glows with southern fire and the book reveals powers of description and structural strength totally unexpected in one who has hitherto wasted himself on the futile record of a worthless society woman or the thin humour of University life. The scenes are placed in the Morea, and some of Mr. Benson's landscape descriptions rise to the level of prose poetry. Throughout comes the refrain, darkly hinting at the vengeance about to be wreaked on the 'unspeakable' Turk;

'Dig we deep around the vines,
Give the sweet spring showers a home,
Else the fairest sun that shines
Sends no sparkle to our wines,
Lights no lustre in the foam.'

Mitsos, the young hero, has a splendid share in the digging and the treading. The conflict of love and duty in the young patriot's soul, consequent on his affection for one Suleima, a Greek girl in the household of Achmet Pasha, shows Mr. Benson at his best. I regret that space does not permit me to give extracts from what in my opinion is one of the books of the year.

* * * * *

The publishers have sent a noble edition of Kingsley's masterpiece 'Westward Ho!' The book follows Macfarlane's 'Camp of Refuge,' as the second of the collection of Historical Novels and Romances which Mr. G. L. Gomme is editing for Messrs. Constable. I cannot too highly applaud the design of the series, which I take it is to deepen the significance of history and verify dry-as-dust records by offering in educational form the products of art and imagination working illustriously on bases of fact. Mr. Gomme prefaces the book with an introduction which is a revelation of Elizabethan daily life, and he supplies a few terse and helpful notes for which every reader must be grateful. The book is interspersed with facsimilies of historic pictures, medals, signatures, &c. Every pupil teacher's library ought to contain this admirable series, as a potent supplement to the formal text-books in use.

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La Récitation appliquée à l'Éducation. Julien Boitel. **Cours Élémentaire** and **Cours Moyen et Supérieur.** These collections of choice recitations and of moral maxims are now in their sixth edition. The French teacher gives much more attention to formal moral instruction than we do, and the extracts are specially selected with a moral aim. The English teacher will learn something from the arrangement of these works; and the teacher of French in our schools will find in them a useful guide to the best French poems, fables, and moral maxims suitable for school use. The biographical notes are likely to be of interest.

L'Année Préparatoire de Récitation. L. Moy. **Cours Élémentaire et Cours moyen.** The special feature of this book is the combination of picture with story or poem to enforce the moral lessons which form the main object. The *résumé*, the *morale*, and the notes, all help to make the book clear and self-interpreting.

Leçons de Choses, en 650 gravures. G. Colomb. **Cours moyen.** As an aid to object lessons, English teachers will get some hints from a book of this nature, which may be compared with the now familiar 'First Year of Scientific Knowledge' in its mode of presentation. This work is, however, strictly elementary, and its teaching is therefore all the more likely to be useful.

HACHETTE ET CIE.

Pour la Patrie. Mme. Colomb. This is a stirring tale of Rouen in the days of our Henry the Fifth. The long and hopeless siege, with its full cup of misery to those within the town; the intrigues and quarrels between those in high places, whereby the town was left to hope in vain for succour from the King of France; the final struggle, and its failure through treachery—all these give scope for vigorous and graphic description. English boys will note specially the aspect which our 'Bluff King Hal' presented to those beyond the Channel, and will gather that there are two sides to most questions. Among the many interesting glimpses of the time must be reckoned the scenes in which Joan the maid appears, though these do not redound to our national credit. Through all these events we trace the fortunes of a few typical burghers of Rouen, interwoven with the web of public history so as to form a delightful and instructive story. A word must be said of the illustrations; while those in black and white are of good quality, there is a number of pictures in colour which can only be described as charming,—excellent drawings, daintily reproduced. To any boy whose French is in a hopeful state of forwardness, this book should prove a treasure.

Monnaie de Singe. Mme. P. de Nanteuil. It would be a pity that any English boy should judge this book by its first two pages. He will there learn that at Waterloo the army under Wellington considerably outnumbered the French, but that, nevertheless, his first line had been destroyed, his second badly cut up, and he was considering the question of a retreat in order to save the remainder of the army, when the Prussians arrived, and a new battle, as one might call it, was fought, which ended as every boy knows already. But the boy reader will soon become interested in the fate of one of the many boys whose fathers fell on the red 18th of June, and that story will hold him fast till the book is finished. It is a story of the disappearance, the adventures, and the recovery of an heir—not a new idea for a plot, but treated freshly, and both the human and the animal characters introduced play their part well. The villain of the piece is paid at the end, as villains should be, in 'monnaie de singe'—or with kicks in place of halfpence, in a very literal sense indeed. The book is well illustrated, and handsomely bound.

Bons Cours et Braves Gens. Maxime Du Camp, de l'Académie Française. This is one of a type of books for the young in which French writers excel. The pictures of genuine devotion to others, often shown in very little things, of family affection, of the sufferings of the destitute, of much that may be looked on as utterly commonplace, and that affords perilous opportunities to the writer to make the easy transition from pathos to bathos—these pictures are drawn with a firm but dainty touch, with frank but not unrestrained detail, with less than English reticence, perhaps, but with somewhat more than English insight. Boys, but especially girls, whose knowledge of the language is equal to the task, will enjoy reading the three stories which make up the book. The illustrations are, as usual with the publishers, of high quality.

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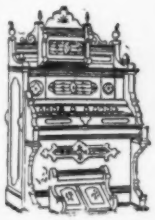

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BLACKIE & SON, LIMITED, LONDON.

The Irish Difficulty: Shall and Will. By Gerald Molloy, D.D., D.Sc. The English usage which assigns distinct functions to the words *will* and *shall* when used as auxiliaries of the future tense gives very little trouble, we suppose, to English people. The difficulty, however, which Dr. Molloy has so thoroughly examined in this little volume is perhaps as much Scotch as Irish, and most readers are acquainted with amusing instances of the misplacing of *will* and *shall* in the speech of Irishmen and Scotchmen. For the benefit of his countrymen and others to whom these little words are as stumbling blocks, Dr. Molloy has compiled this volume, and he has set about his task in a thoroughly rational and scientific method. He has recognised that the basis of the idiom is no necessary natural law, but simply common usage. By the collection and classification of some hundreds of illustrative examples from the works of standard English authors, he shows that the idiom is the result of a process of evolution, and that it has undergone considerable change in modern English. The following are the propositions in which our author states his conclusions on the history of the idiom:—

"1. In the English of Wycliffe's Bible, there was only one future auxiliary, *shall*, which was used alike in all persons;

2. During the two centuries that followed the Wycliffe's time, the use of *will*, as a second auxiliary, was introduced, and at the close of the Elizabethan age, the modern idiom was fairly established in its more important features;

3. But even in the Elizabethan age, the use of *shall*, as the sign of simple futurity in all persons, still lingered on; and in the literature of that period traces of the old idiom are to be found, not uncommonly, side by side with the new;

4. By the middle of the seventeenth century, the modern idiom, in its more essential features, was firmly fixed, recognised by grammarians, and reduced to rule."

Dr. Molloy points out that in the German language "there are three auxiliaries of the future tense: *werden*, *wollen*, and *sollen*. The first expresses simple futurity; the second, volition; the third, obligation." To the fact that in English we have only two auxiliaries to express these three ideas, he traces the origin of the difficulties which attend the use of *will* and *shall*. The general rule which is to be found in nearly all English grammars is found to be subject to considerable modification by a variety of special circumstances; thus we have the use of "the prophetic shall," the use of *would* and *should* in indirect and conditional statements. These and other variations afford matter for much ingenious and interesting comment with abundant illustration. Every student of the English language may read this book with interest and advantage.

The Newton Science Readers. Infant Reader, and Books I. and II. By W. Furneaux. An apt name has been chosen for the new series of reading books just issued by Messrs. Blackie. In the Infant Reader we find a very attractive set of lessons likely to interest children on the natural objects in the country. They are presented in the form of simple conversational stories on such things as birds, beasts, insects, plants, and natural phenomena.

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The Palmerston Readers. Book V. worthily continues the series, the earlier numbers of which we have already noticed—a series which well maintains the reputation of the publishers. Recent and standard works of travel, adventure, and fiction furnish material for many of these reading lessons, among others Conan Doyle's 'The White Company,' George Eliot's 'Silas Marner,' and Rider Haggard's 'Jess.' The capital illustrations in colour form a noteworthy feature, and the material production is every way commendable.

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Chambers's Alternative Geography Reader. Standard IV. In the form of a brightly-written story, telling how a boy named Fred Green spent a holiday at the seaside with his uncle, an old sea-captain, and how they had a delightful voyage from Liverpool to London in the yacht *Siren*, the writer of this book gives some thoroughly clear and interesting instruction on elementary geography. This method may be called the concrete method of teaching geography; and the cheery narrative in combination with the excellent full-page illustrations, chiefly reproduced from Frith's photographs, and the smaller diagrams and sketch maps cannot fail to interest and impress the young readers. We have much pleasure in recommending it for use in schools where Geography is begun in Standard IV.

LONDON: CURWEN & SONS.

The Speaking Voice: its development and preservation. By Mrs. Emil Behnke. Mrs. Behnke's little book has been written at the request of numerous friends and pupils. It contains a large number of excellent exercises in vocal gymnastics, and much practical advice on the general treatment of the speaking voice. Mrs. Behnke has had long and successful experience in this kind of work, and gives her directions with the clearness and confidence born of intimate knowledge. The book is well illustrated by diagrams and reproduced photographs, and we have much pleasure in commending it to the attention of our readers.

The Singer's Guide. By John Adcock. New Edition. According to the title-page this work comprises 'plain and practical rules (with examples and exercises) on the singing of English, Italian, Latin, German, French, and Scripture Proper Names; together with a Pronouncing Dictionary of Musical Terms (Italian and German), a Pronouncing Vocabulary of Musicians and of Musical Works'; and a supplement containing remarks on the 'Art of Chanting,' etc. Within the compass of some eighty pages Mr. Adcock communicates much valuable information on the various topics enumerated, the exercises on English pronunciation being unusually good.

T. FRASER, DALBEATTIE.

Border Raids and Reivers. By Rev. R. Borland.—The interest in the study of Border lore aroused by the labours of Bishop Percy and Sir Walter Scott has not been allowed to die out from lack of workers. Tradition has been reduced to legend, and there are now many books dealing with the history or romance of the Scottish Borders. Reiving played a leading part in the drama of these troublous times, and is of necessity referred to in all books of Border literature. The present volume is, however, the only publication as yet which devotes itself mainly to Raids and Reivers. Beginning with a spirited description of an invasion by the 'auld enemy,' Mr. Borland traces the history of these expeditions by the light of 'Macfarlane's lantern' from their origin to the period of their culmination, and onward through their decline to their ultimate termination. The outstanding features of these moss-trooping times form the thread on which the author crystallizes his information. Thus we have an account of the duties and emoluments and powers attaching to the office of Warden of the Marches. The law of the 'Hot-trod,' the form of procedure on the day of truce, the plans adopted in carrying out the 'deadly feud' between rival families, and the means employed to 'daunton the thieves' are graphically and realistically described. The publisher has given proof of admirable taste in binding, paper and type, and, with the author and illustrator, is to be complimented on having produced a handsome and interesting book.

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First Year of Scientific Knowledge. By Paul Bert. Revised edition by Richard Wormell, D.Sc., M.A., Lond., and Montagu Lubbock, M.D., Lond. and Paris, and F.R.C.P., Lond. A school book which has sold by hundreds of thousands in its original French form, and gone through many editions in the English translation by Madame Paul Bert, stands in no need of recommendation. It comes before us now, however, so largely revised and extended, that we feel justified in examining it more fully than is usual in the case of new editions of well-known books. At the outset we may say that the form appears to us greatly improved. We have compared it with an earlier copy, and find the page broader and the type better. This gives to the arrangement of the text an appearance of greater clearness. The work is divided as before into seven

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sections treating respectively of Animals, Plants, Stones and Soils, Physics, Chemistry, Animal Physiology, and Vegetable Physiology; but considerable additions have been made, especially in the section on Physics, where the matter has been brought up to date. The total number of pages has been increased by sixty odd. The admirable small clear illustrations which formed such a useful and attractive feature are all retained, and, with some few added ones, now number more than 560.

The meagre little 'dictionary' of three pages at the end of the older book has been expanded into a 'glossary and index' of twenty-five pages much better printed. Reference is made throughout the book to this glossary by asterisks after the words needing explanation.

Now as to the work of the revisers. As educationists of wide experience, as well as scientific knowledge, and in one case at least eminent as a practical teacher, they have doubtless done much to increase the educational value of the work, by their careful corrections and by the addition of matter to make the whole more complete. We must own, however, that we miss a little the simple personal touch which was so prominent a feature in Madame Bert's original translation. The practical experts have cut out all the references to George and Henry and their uncle, and the result is somewhat more formal. Still the book is simply written, and is full of interest and instruction. It would, not, however, bear much more extension without needing to be renamed, as it already contains more than can well be studied in one year, if all the sections are to be attempted.

SOME NEW FRENCH BOOKS.

Third Year in French. By L. C. Syms. (American Book Company.) This book presents no particularly novel features but is a good and conscientious production, well adapted for students who have made a little progress in the study of French.

French Composition and Idioms. By Hector Rey. (Blackie & Son.) An extremely practical book. The idioms are arranged according to the verbs or other parts of speech involved, and constant comparison is made with the corresponding English expressions. A student who works carefully through this book according to the author's directions should acquire the power of writing real French, and not French words in English idiom.

Quand j'étais petit, Part II. Biart. Edited by Jas. Boïelle, B.A. (Cambridge University Press.) A book which delights by the freshness of its theme. It is the story of a child's experiences as told by himself when a man of mature years. It is true to nature and to life. To copy a well-known remark of Dr. Johnson, it is the kind of book to draw a reader from bed before his usual hour of rising. The notes are well done and there is a good vocabulary.

Remi et Ses Amis, a selection from 'Sans Famille.' By Hector Malot. (Cambridge Press.) Edited by Margaret De G. Verrall. The selection included in this volume has been made by the author from his most popular novel 'Sans Famille.' It forms a story practically continuous, and with a certain completeness of its own. The style is delightful: while crisp, bright, and simple, it is idiomatic and distinctive. The incidents and characters are set forth in most attractive fashion, and above all the moral teaching is admirable. In the introduction the editor gives enough of the previous part of the story to make certain references readily intelligible to the reader. On a sketch map prefixed to the volume Remi's journey is carefully traced. The notes are of a truly helpful kind, and the vocabulary is full enough for the reader to dispense with a dictionary. The whole is well printed and neatly produced.

Hector Malot: Remi et Ses Amis. Épisode de 'Sans Famille.' (Hachette & Co.) Edited by J. Maurice Rey, B. ès L. A more pleasing work could hardly have been chosen for the Cambridge Local Examinations than this selection which M. Hector Malot has arranged for school use from his novel 'Sans Famille.' The editor has supplied a brief introduction to prepare the English student to understand the connection of the incidents, and a very useful 'general note' at the end to help him over the most frequent grammatical difficulties. There are also plenty of helpful notes on special words and passages, as well as geographical and historical notes and an ample vocabulary. The edition will be found thoroughly serviceable, and can be strongly recommended.

Un Peu de Tout. By F. Julien. (Low & Co.) This book supplies the material for an immense amount of oral practice in French. The author has collected and classified on a very convenient plan many hundreds of phrases and sentences in English to be turned into French. These are arranged in groups of ten, so as to bring together those that have certain points of likeness with more or less of variation. The sentences have been carefully graduated, and illustrate all the common French idioms, and nearly all the possible grammatical difficulties. The latter part of the book forms a key to the first, containing as it does, in similar groups and with corresponding numbers, the French translations of the whole series of English sentences, together with notes on grammatical points. The work is not intended to be used instead of a grammar book and reader, 'but to give a final polish to the work of those preparing for examination.' We can well believe that the student who steadily works his way through this abundant practice, and who makes wise use of the key for re-translation will obtain a real mastery over French idiom as well as a copious vocabulary.

French Verbs Simplified. By F. Julien. M. Julien has divided the French irregular verbs into those which are *simply* and those which are *doubly* irregular, and by constructing two tables which show the formation of tenses in these two classes, and which are printed in red on two special pages, the vast number of irregular verbs are reduced to some sort of rule. There are only about six verbs which must be learnt separately as not conforming to either of the two tables. At the end is given a list of verbs with derived substantives. The book is conveniently arranged, and is likely to prove a very useful help to the acquisition of a good knowledge of the French verb.

Histoire de la Première Croisade. Par Michaud. Edited by A. V. Loughton, B.A. (Macmillan & Co.) A well-chosen series of extracts from Michaud's History of the Crusades. The notes are good, and the book contains in addition a life of the author, historical introduction, words and sentences for viva-voce drill, extracts for re-translation, and a chapter on word formation. The editor has given the teacher every possible help for getting the maximum of profit from a study of the work.

French Stumbling-blocks and English Stepping-stones. By Francis Tarver, M.A. (John Murray.) This book is the result of the ripe experience following many years' work of the late French Master of Eton. It 'touches the spot' in dealing with precisely those difficulties of French which form a hindrance to the average Englishman. Both elementary and advanced students will derive profit from its perusal, and the teacher of French will pick up from it many a hint for his guidance.

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French Whys and Wherefores, Vol. II., No. 9. By Léo Melliet, B.A., LL.B. Published monthly from October to May by Pillans & Wilson, Hanover Street, Edinburgh. The number before us contains an English teacher's rendering into French of an extract from Ruskin, with M. Melliet's criticisms, answers to queries, and queries to be answered. This pamphlet ought to prove a wonderfully good investment for private students of French, who can get for sixpence a month good and reliable information which might otherwise cost them much more.

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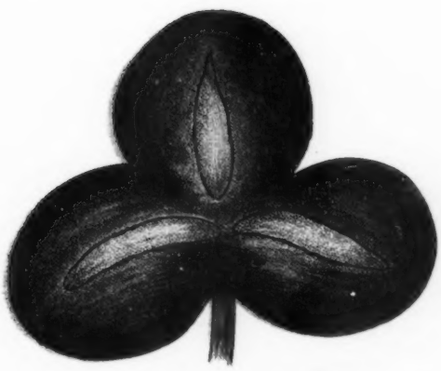

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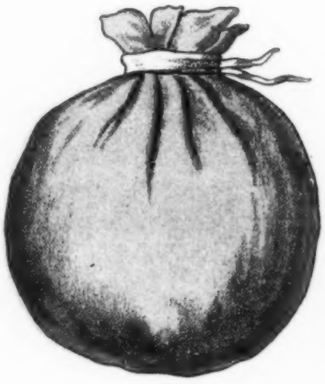

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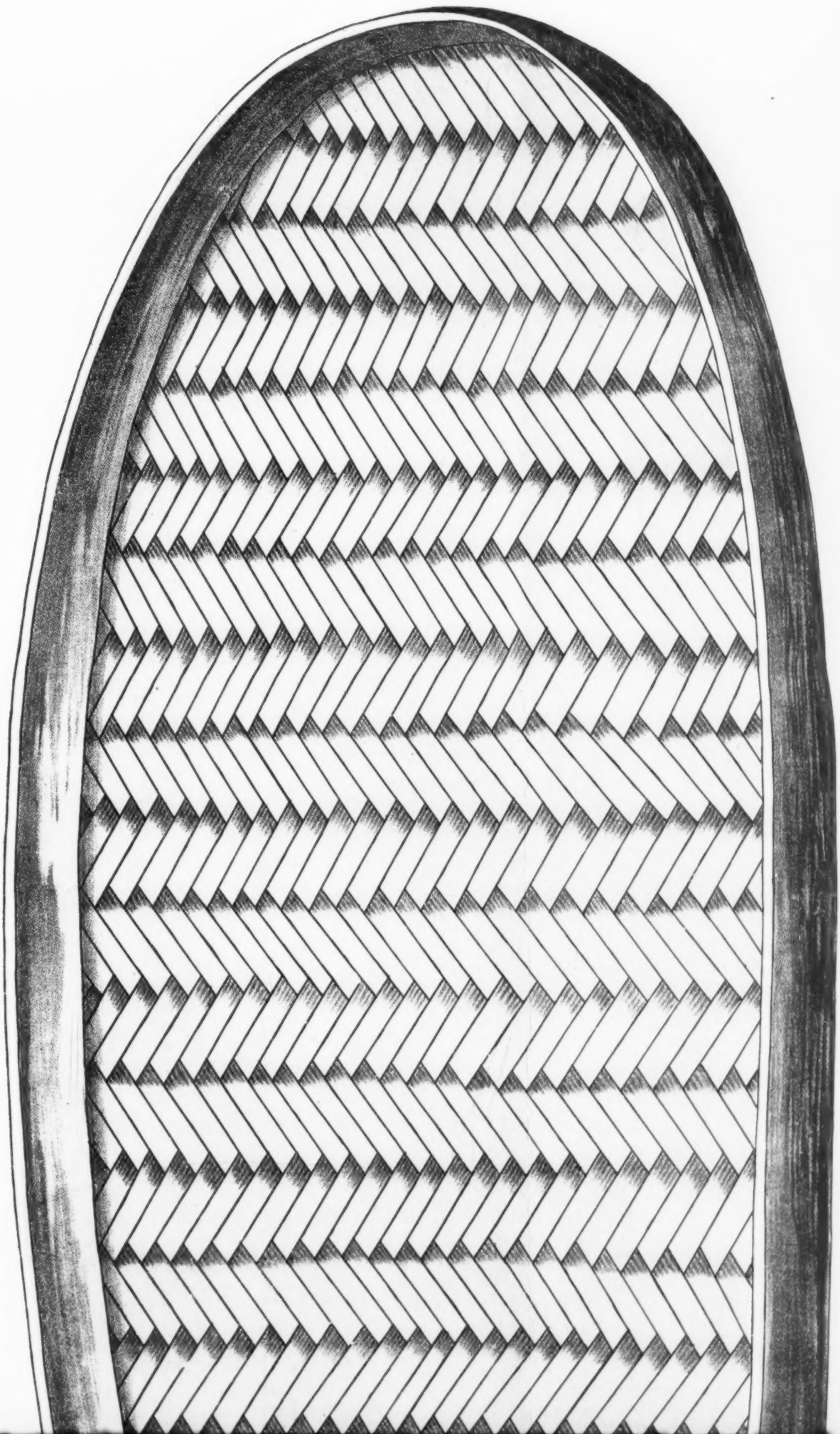

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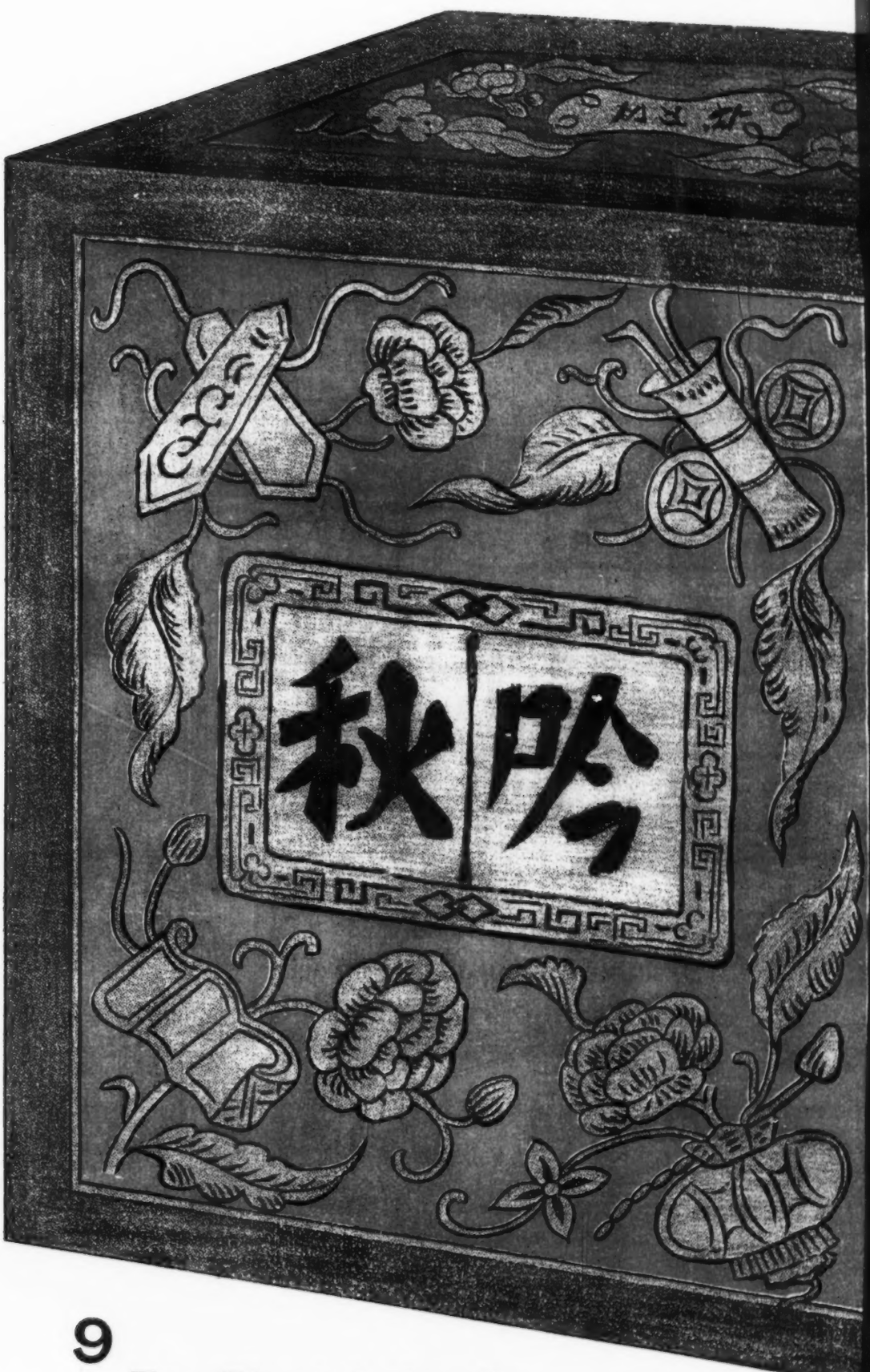

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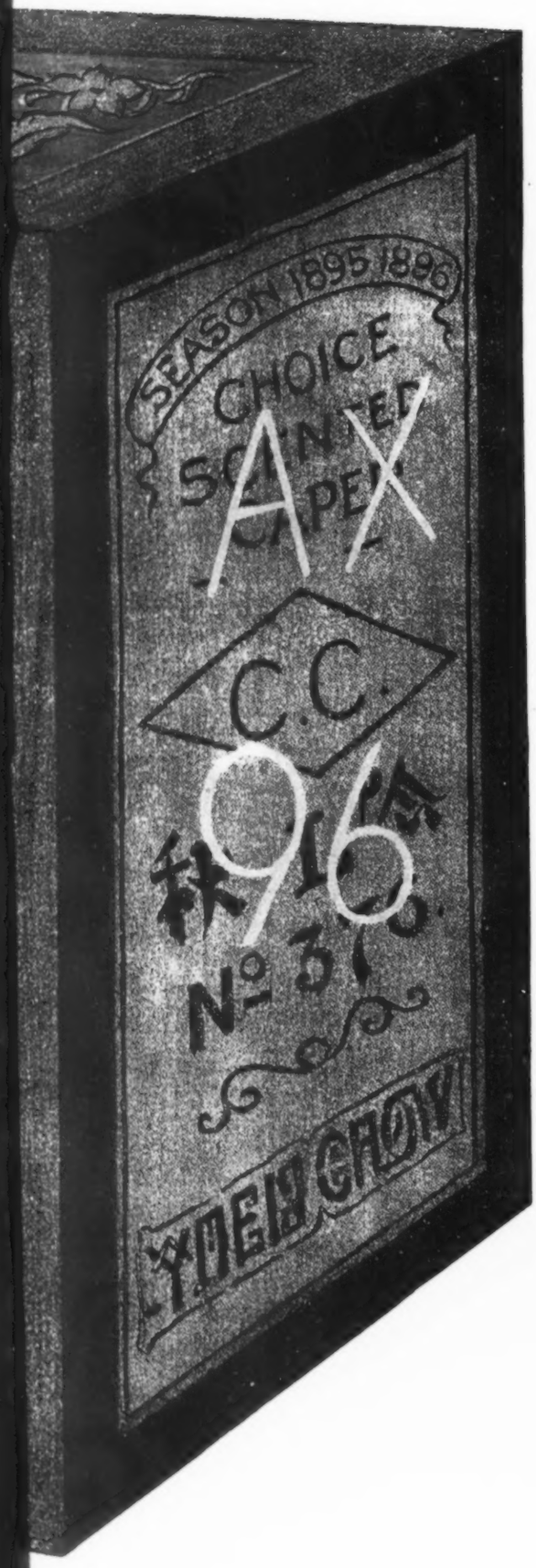

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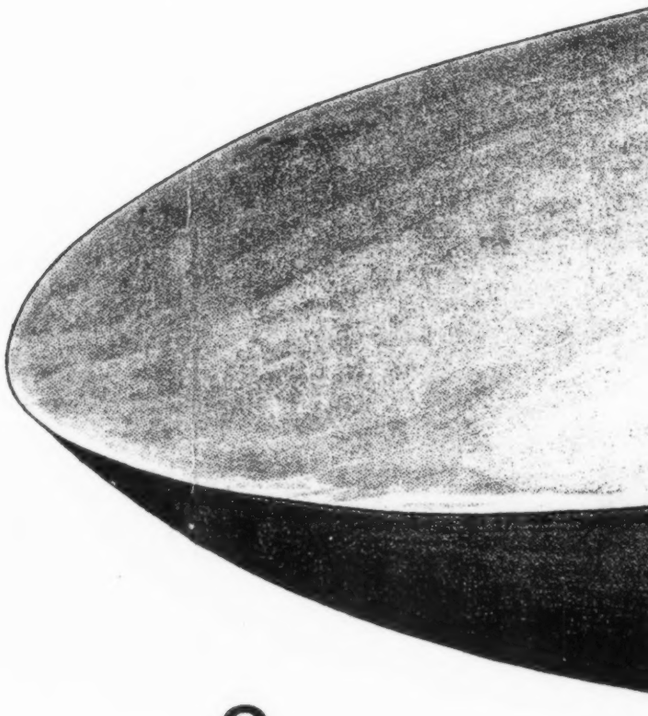

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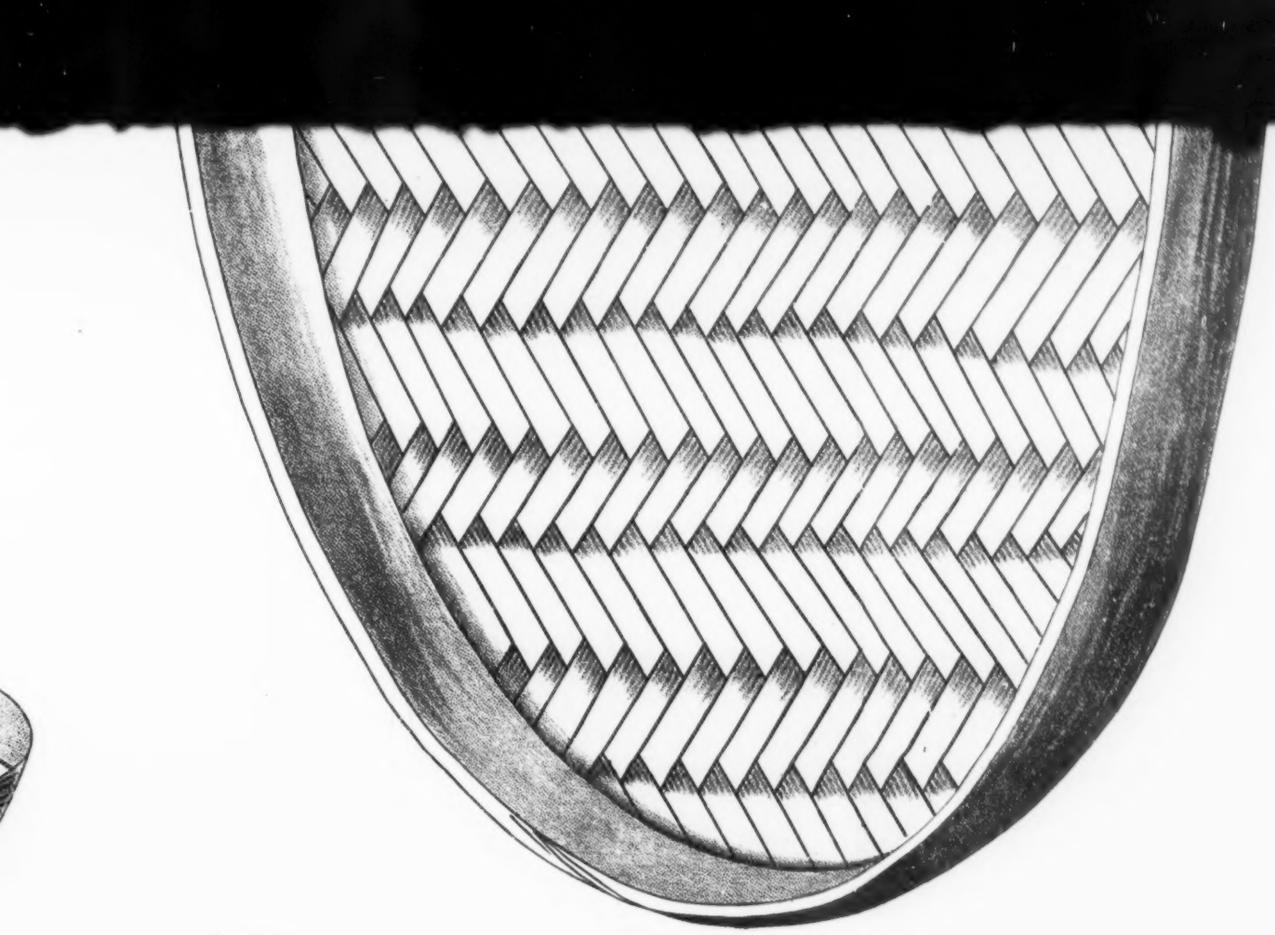

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PRACTICAL TEACHER
MARCH 1898.

PRINTED BY EYRE & SPOTTISWOODE, *Her Majesty's Printers*, DOWNS PARK ROAD, N.E., and PUBLISHED BY THE PROPRIETORS AT THE OFFICE OF 'THE PRACTICAL TEACHER,' 33, PATERNOSTER ROW, LONDON, E.C.